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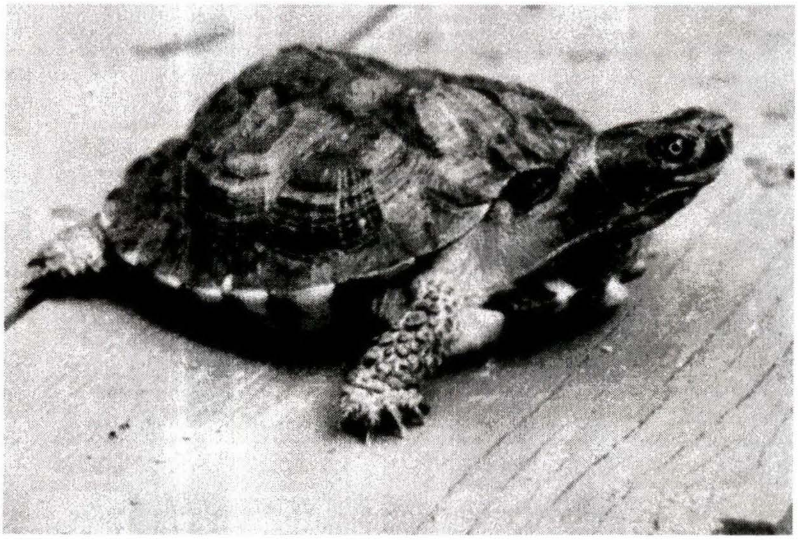
Biological Evaluation Of the Green Mountain National Forest Land & Resource Management Plan For Conservation and Management of Regional Forester Sensitive Species



Biological Evaluation
Of the
Green Mountain National Forest Land & Resource Management Plan
For
Conservation and Management of Regional Forester Sensitive Species

Green Mountain National Forest
Vermont

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Introduction

This Biological Evaluation (BE) is prepared in accordance with direction provided in Forest Service Manual (FSM) 2672.41 and 2672.42. The purpose of this document is to determine the effects of implementation of the Green Mountain National Forest (GMNF) Land and Resource Management Plan (Forest Plan) on species recently added to the Regional Forester Sensitive Species (RFSS) list. The need for this review was precipitated by an update of the RFSS list and process for identifying and evaluating potential RFSS (USDA 2000a).

This BE, therefore, will determine if the Forest Plan management direction (a) protects these sensitive species, which are inherently rare or not naturally well distributed in the plan area, by not contributing to their extirpation; and (b) provides ecological conditions to maintain these sensitive species considering their natural distribution and abundance.

Project Description

The project in this evaluation is implementation of the existing GMNF Forest Plan, as amended to date, which is the direction currently guiding management of the GMNF. Goals, objectives, standards and guidelines currently in the Forest Plan guide management for many resources, including RFSS. A recently completed Biological Assessment for Threatened and Endangered Species (USDA 1999) reviewed in detail the range of management activities conducted on the Forest over the past several years under Forest Plan guidance, and is incorporated by reference for the purpose of describing the details of Forest Plan implementation.

The purpose of this evaluation is to determine if newly designated RFSS are adequately conserved and managed under the guidance provided by these goals, objectives, standards, and guidelines. FSM 2670 clearly requires that Forests develop and implement management objectives for RFSS. The need for this review came about as a result of a recent update to the RFSS list. During the spring and summer of 1999, the Eastern Region's (R9) National Forests gathered information and met in a series of sub-regional workshops to initiate review and update of our RFSS and list. The goal of this update was to integrate new information, gathered since the previous update of March 8, 1994, along with newly adjusted designation criteria designed to better address the National Forest Management Act (NFMA) viability requirements for respective R9 National Forests (supplement to FSM 2670, Amendment 2600-2000-1). The GMNF evaluated over 200 plant and animal species, including those listed in the Forest Plan as sensitive or species of concern, those on the State of Vermont's threatened, endangered, or rare lists, as well as others identified by concerned citizens. The resulting list of sensitive species was formally designated as RFSS on February 29, 2000 (USDA 2000a); the GMNF identified 87 species for inclusion on this Regional list.

Determination of Species Likelihood of Occurrence

The RFSS list identifies 665 species as sensitive for Region 9 (USDA 2000a). The RFSS list is designed to identify species for which population viability is a concern, so that management action may be taken to ensure these species do not become threatened or endangered because of Forest Service actions, and to ensure that "viable populations of these species are maintained in habitats distributed throughout their geographic range on National Forest System lands." (FSM 2670.22). However, not all species identified on the RFSS list are classified as sensitive for the GMNF. In order to be evaluated for listing as sensitive on the GMNF, an individual species is required to have known occurrences within the GMNF. The RFSS list, as updated on February 29, 2000, identifies those species considered present on the GMNF with either a "+" for being present but not recommended as sensitive, or an "R" for being both present and recommended as sensitive. The remaining species are not known to occur on the GMNF, although several are known to occur either currently or historically within Vermont.

Evaluations of these species indicate that they have no known historic or extant occurrences on the GMNF, and are not likely to occur within the GMNF based on the best available information (Appendix 1). Evaluation of occurrences and status is based on reviews of Vermont Nongame and Natural Heritage Program (VNNHP) records (VNNHP 1999; VNNHP 2000) and reviews of state listed and rare species with the VNNHP (VNNHP, pers. comm. 1999); where VNNHP has no records for or does not track these species, other references were used (Jenkins 1988; Jenkins 2000, pers. comm.; Gilman 1999; Andrews 1995; DeGraaf & Yamasaki 2001; DeGraaf et. al. 1991; Fichtel & Smith 1995; Godin 1977; Laughlin & Kibbe 1985; Peterson 1980) Consequently, species that are not present, nor likely to occur, on the GMNF are not considered further in this document, as they will not be affected by implementation of the Forest Plan due to the absence of populations or critical habitat.

Table 1 identifies all of the current RFSS species identified as being present but not sensitive for the GMNF. For these species, risk evaluations (USDA 2000b) or other information indicated that these species were not at risk on the National Forest because either (a) their populations and/or habitat appeared to be viable and sustainable on the National Forest in the context of the Forest Plan, or (b) they were represented by either very old or unverified historic records or did not appear to have suitable habitat on or near National Forest System (NFS) lands within the GMNF proclamation boundary. In addition, other state agencies (e.g. VNNHP, VT DFW) or knowledgeable individuals did not consider these species to be at risk within the GMNF. Consequently, these species will not be considered further in this evaluation because extant populations or suitable habitat does not occur within the influence of GMNF management, or their populations do not appear at this time to be at risk of loss of viability or a trend towards federal listing, as populations and habitat appear sustainable at this time. Table 1 indicates for each of these species the rationale for dismissing them from further consideration here.

Table 2 identifies the current RFSS designated as sensitive for the GMNF and known to occur or have suitable habitat on the GMNF, and includes habitat requirements and present or historic occurrences (USDA 2000a).

In addition to the species identified in Table 2, Table E.01 and E.02 of the Forest Plan lists "protected species" for the GMNF, seven of which are identified as "Recommended Sensitive Species". These species are: Canada lynx (*Lynx canadensis*); Eastern small-footed bat (*Myotis leibii*); Long-tailed shrew (*Sorex dispar*); New England cottontail (*Sylvilagus transitionalis*); Common loon (*Gavia immer*), Loggerhead shrike (*Lanius ludovicianus*), and Eastern jacob's ladder (*Polemonium vanbruntiae*). At the time the Forest Plan was adopted, it was not clear that these species would ultimately be accepted by the Region as sensitive, hence the "Recommended" qualifier. Upon Regional Forester signature of the Forest Plan, however, these species were accepted as sensitive, and have been treated as such during implementation. Of those species identified as "recommended sensitive", Canada lynx has been federally listed as threatened and so its RFSS designation is superceded by the Endangered Species Act (ESA); Eastern small-footed bat, Common loon, and Eastern jacob's ladder are on the recently updated RFSS list; and Long-tail shrew, New England cottontail, and Loggerhead shrike are no longer considered Region 9 sensitive species for the GMNF due to lack of known or likely occurrences on the GMNF. The habitat requirements and occurrences for these last three species that are not on the updated RFSS list are identified in Table 3.

As all of the current GMNF's Region 9 sensitive species are known to occur on the Forest, they have the potential to be affected by actions undertaken to implement the Forest Plan. Although the species in Table 3 may not be known to occur within the GMNF, their change in status from that indicated in the Forest Plan indicates the need for an evaluation of the effects of Forest Plan implementation on these species. Consequently, all of the species in Tables 2 and 3 will be carried forward into the Analysis of Effects section of the BE.

Table 1. – Review of Regional Forester's Sensitive Species known (extant or historic) or likely to occur, but not identified as sensitive, on the GMNF, with rationale for dismissing species from further analysis.

Scientific Name	Common Name	Rationale
PLANTS		
Anemone quinquefolia	Wood anemone	Common (Jenkins 1988)
Asplenium rhizophyllum	Walking-fern spleenwort	Populations and habitat appear secure in Vermont (S4; VNNHP 1999); habitat marginal on NFS
Aster macrophyllus	Large-leaf aster	Common (Jenkins 1988)
Botrychium lunaria	Moonwort grape-fern	State historic; known only from the Taconics and Vermont Valley areas of the Proclamation Boundary with little NFS land. Historic occurrences and critical habitat not in or near NFS lands (VNNHP pers. comm.).
Carex buxbaumii	Buxbaum's sedge	Known only from the Taconics and Vermont Valley areas of the Proclamation Boundary with little NFS land. Although quite rare, occurrences and critical habitat not in or near NFS lands (VNNHP pers. comm.).
Carex communis	Fibrous-root sedge	Common (Jenkins 1988)
Carex stricta	Tussock sedge	Common (Jenkins 1988)
Dalibarda repens	Robin runaway	Occasional (Jenkins 1988); not tracked as rare or uncommon by VNNHP (VNNHP 1999)
Dicentra canadensis	Squirrel-corn	Common (Jenkins 1988)
Dryopteris goldiana	Goldie's woodfern	Populations and habitat appear secure in Vermont (S4; VNNHP 1999); occasional on NFS and appears stable (Burbank pers. obs.)
Eleocharis olivacea	Capitate spikerush or Olivaceous spikerush	Known only from unverified historic records on NFS (VNNHP pers. comm.); both historic sites have been well surveyed and no extant populations discovered (VNNHP 1997); other sensitive species known from these sites ensure habitat protection.
Epigaea repens	Trailing arbutus	Common (Jenkins 1988)
Eupatorium sessilifolium	Upland boneset	Known only from the Taconics and Vermont Valley areas of the Proclamation Boundary with little NFS land. Although quite rare, occurrences and critical habitat not in or near NFS lands (VNNHP pers. comm.).

Scientific Name	**Common Name**	**Rationale**
Galium kamtschaticum	Boreal bedstraw	Occasional in VT (Jenkins 1988); known only from historic (1906-1913) records on GMNF (Jenkins 1982).
Gaultheria hispidula	Creeping snowberry	Common (Jenkins 1988)
Juncus filiformis	Thread rush	Occasional in VT (Jenkins 1988); not tracked by VNNHP as rare or uncommon (VNNHP 1999).
Lilium canadense	Canada lily	Common (Jenkins 1988)
Liparis liliifolia	Large twayblade	Known only from the Taconics and Vermont Valley areas of the Proclamation Boundary with little NFS land, and only historically from these areas. Although quite rare, historic occurrences and critical habitat not in or near NFS lands (VNNHP pers. comm.).
Listera cordata	Heartleaf twayblade	Occasional in VT (Jenkins 1988); not tracked by VNNHP as rare or uncommon (VNNHP 1999); known historically from one site on Forest (1912).
Luzula parviflora	Small-flowered wood-rush	Populations on NF appear to be secure and resilient to disturbance (Burbank pers. obs.)
Platanthera clavellata	Small green woodland orchid	Occasional in VT (Jenkins 1988); not tracked by VNNHP as rare or uncommon (VNNHP 1999); known historically from 7 sites on Forest (all over 50 years old).
Poa alsodes	Grove meadow grass	Common (Jenkins 1988)
Polystichum braunii	Braun's holly-fern	Occasional in VT (Jenkins 1988); considered uncommon to apparently secure by VNNHP (S3S4; 1999); historic occurrences on NF continue to be relocated in areas of historic logging, as well as new sites, suggesting resilience.
Pyrola asarifolia	Pink wintergreen	Known only from the Taconics and Vermont Valley areas of the Proclamation Boundary with little NFS land. Although rare, occurrences and critical habitat not in or near NFS lands (VNNHP pers. comm.).
Pyrola minor	Lesser wintergreen or Small shinleaf	Known from only 1 site on GMNF, which is historic (1904) and which has been a favorite area for botanists with no success at relocating it.
Thelypteris noveboracensis	New York fern	Common (Jenkins 1988)
Tiarella cordifolia	Heart-leaved foam-flower	Common (Jenkins 1988)
Ulmus americana	American elm	Common (Jenkins 1988)

Scientific Name	**Common Name**	**Rationale**
Vaccinium cespitosum	Dwarf huckleberry	Occasional in VT (Jenkins 1988); considered rare to uncommon by VNNHP (S2S3; 1999); known only from private land outside the influence of NF management; occurrences and critical habitat not associated with NFS lands.
Vaccinium stamineum	Large cranberry	Known only from the Taconics and Vermont Valley areas of the Proclamation Boundary with little NFS land. Although quite rare, occurrences and critical habitat not in or near NFS lands (VNNHP pers. comm.).
Viburnum recognitum	Northern arrow-wood	Common (Jenkins 1988)
Viola lanceolata	Lance-leaved violet	Known only from the Taconics and Vermont Valley areas of the Proclamation Boundary with little NFS land, and only historically from these areas. Although quite rare, historic occurrences and critical habitat not in or near NFS lands (VNNHP pers. comm.).
Waldsteinia fragarioides	Barren strawberry	Occasional in VT (Jenkins 1988); considered apparently secure by VNNHP (S4; 1999); known only historically from NFS.
NONVASCULAR PLANTS		
Campylium stellatum	Yellow starry fen moss	Gilman (1999) suggests that this species occurs on the GMNF, although we have no documentation of occurrences or habitat relationships at this time.
Dichelyma capillaceum		Gilman (1999) suggests that this species occurs on the GMNF, although we have no documentation of occurrences or habitat relationships at this time.
MAMMALS		
Lutra canadensis	River Otter	Common on GMNF and in VT
Lynx rufus	Bobcat	Common on GMNF and in VT
Myotis septentrionalis	Long-eared myotis	Common on GMNF and in VT
Pipstrellus subflavus	Eastern pipstrelle	Common on GMNF and in VT
Ursus americanus	Black bear	Common on GMNF and in VT
BIRDS		
Accipiter gentilis	Northern goshawk	Common on GMNF and in VT
Buteo lineatus	Red-shouldered hawk	Common on GMNF and in VT
Circus cyaneus	Northern harrier	GMNF has no suitable habitat
Contopus cooperi	Olive-sided flycatcher	Common on GMNF and in VT
Dendroica caerulescens	Black-throated blue warbler	Common on GMNF and in VT
Empidonax flaviventris	Yellow-bellied flycatcher	Common on GMNF and in VT

Scientific Name	**Common Name**	**Rationale**
Picoides arcticus	Black-backed woodpecker	Not currently known on GMNF; habitat extremely limited and fragmented
AMPHIBIANS		
Hemidactylium scutatum	Four-toed salamander	Not currently known on GMNF; limited habitat (< 1200' elevation) is protected by management
INSECTS		
Helocordulia uhleri	Uhler's sundragon	Common on GMNF

Table 2. – Review of Regional Forester's Sensitive Species classified as sensitive for the GMNF and known to occur or likely to occur on the National Forest.

Species	**Habitat Requirements**	**Occurrences (present or historic)**
BIRDS		
Peregrine falcon* *Falco peregrinus anatum*	Requires high cliffs with clear views of surrounding areas for nesting. Can also be found nesting on buildings, bridges, or the ground.	Known from cliff sites on the Forest in Addison and Rutland Counties. Historic occurrence on other cliff sites within the Forest is known.
Bicknell's thrush *Catharus bicknellii*	Coniferous forests above 3000 feet; spruce-fir krummholtz.	Known from Forest in Addison, Bennington, and Windham counties at high elevations.
Common loon* *Gavia immer*	Lakes and ponds at least ¼ mile long; nests on water's edge; requires adequate prey base of small fish, amphibians to feed young.	Known to nest within GMNF (Somerset Reservoir, Wallingford Pond, Bourn Pond), and to utilize other GMNF lakes (Branch Pond, Grout Pond)
MAMMALS		
Eastern small-footed bat* *Myotis leibii*	Requires caves, old buildings, mines, rock crevices, and possibly hollow trees for roost sites. Will use aspen, softwood, pine, upland openings, and wetlands, usually up to 2,000' elevation.	Known from the only hibernaculum on the Forest in Windsor County in the town of Stockbridge. Summer habitat is poorly understood.
AMPHIBIANS		
Jefferson salamander *Ambystoma jeffersonianum*	Apparently restricted to vernal pools below 1200' elevation. Hides in rodent burrows and beneath leaf litter, logs, and other surface objects. Hibernates underground or in rotting logs.	Known to occur within GMNF boundary; occurrence on NFS ownership is very limited.

Species	Habitat Requirements	Occurrences (present or historic)
REPTILES		
Wood turtle *Clemmys insculpta*	Lives along permanent streams during much of each year, but in summer may roam widely overland and can be found in a variety of terrestrial habitats adjacent to streams, from deciduous woods, cultivated fields, and woodland bogs, to marshy pastures. Use of woodland bogs and marshy fields is most common in the northern part of the range.	Known to occur within GMNF boundary
MOLLUSKS		
Brook floater *Alasmidonta varicosa*	Requires firmly packed sand and gravel stream bottoms of small rivers and streams. .	Known from the West River in Windham County along the proclamation boundary of the Forest
Creek heelsplitter *Lasmigona compressa*	Stream bottoms. The host fish species for the creek heelsplitter is not known.	Known to occur in Otter Creek, nearly to the headwaters in Mt. Tabor.
INSECTS		
Black-tipped darner *Aeshna tuberculifera*	A large aeshnid inhabiting small upland ponds, which support extensive stands of aquatic vegetation, the larvae clinging to submerged cattails and other aquatic vegetation. Adults are brown with lime green lateral thoracic stripes. Males are normally found patrolling near shore at 1-2 feet above the water.	Known from Lost Pond, Manchester District of the GMNF.
Green-striped darner *Aeshna verticalis*	A large aeshnid, inhabiting marshy ponds, the larvae clinging to sedges and other aquatic vegetation. Adults are very similar to the much more common *A. canadensis*, from which it can be distinguished by a browner abdomen and less constricted lateral thoracic stripes. Males often fly from 2-10 feet over marshes. This species is the wariest of the aeshnas.	Known from Grout Pond, Manchester District of the GMNF.
Lilypad clubtail *Arigomphus furcifer*	A medium-sized gomphid inhabiting lily ponds typically within 200 km north of the eastern glacial terminus front, from Iowa to New Hampshire. The larvae burrow relatively deeply into the soft mud of bogs, ponds, and lacustrine bays. Adults are distinguished from related species by the extensive green markings on the front of the thorax and the grayish blue eyes.	Known from Lost Pond, Manchester District of the GMNF.
Superb jewelwing *Calopteryx amata*	Large damselflies inhabiting fast—flowing mountain rivers and streams. The light brown wing apices and elongate metallic green bodies distinguish adults.	Known for the Deerfield River and from Stamford Stream, Manchester District of the GMNF.

Species	**Habitat Requirements**	**Occurrences (present or historic)**
Cobblestone tiger beetle *Cicindela marginipennis*	Inhabits cobble areas along river shores, but primary habitat is cobble islands. Plants associated with this species are *Salix* spp., *Apocynum* spp., and occasionally *Prunus pumila*. In NH and VT, it is found on islands large enough to support full sized trees.	Known from the Connecticut River. Not within GMNF proclamation boundary
Harpoon clubtail *Gomphus* [=*Phanogomphus*] *descriptus*	A medium-sized gomphid inhabiting streams and small rivers, larvae burrowing in the soft mud of pool areas. Adults are distinguished from related species by the narrow bright green markings on the front of the thorax. Males typically perch on streamside vegetation along riffle areas.	Known from the Deerfield River, Manchester District of the GMNF.
Mustached clubtail *Gomphus adelphus*	A species having a general Appalachian distribution.	Known from the Deerfield River, Manchester District of the GMNF.
Southern pygmy clubtail *Lanthus vernalis*	A small gomphid inhabiting tiny, mud—bottomed, spring—fed streams; the larvae burrowing in the fine silt of pool areas. Adults are distinguished from related species by the thorax laterally light green with a narrow black line. This gomphid is almost exclusively found in association with populations of native brook trout (*Salvelinus fontinalis*).	Known from Bourn Brook, Manchester District of the GMNF.
Amber-winged spreadwing *Lestes eurinus*	A large lestid, which inhabits the shrubby borders of bog ponds. Their tinted wings distinguish adults. Although widespread in eastern North America this species is very local in occurrence.	Known from 4 ponds of the Manchester District of the GMNF – Beebe, Lost, Moses and Mud.
Maine snaketail *Ophiogomphus* [=*Ophionurus*] *mainensis*	A medium-sized gomphid inhabiting streams and sometimes rivers; larvae burrow into the sand and gravel between cobble sized rocks. Adult males are distinguished by the large lateral spines of the epiproct, and the female by large anteriorly directed occipital horns. Males are typically found perching on rocks in midstream; they are usually more abundant at streamside near dusk. New populations should be looked for downstream from known *Lanthus* populations. This species also seems to prefer streams, which drain ponds or small lakes.	Known from the Deerfield River, Manchester District of the GMNF.
Ski-tailed emerald *Somatochlora elongata*	One of the large holarctic *Somatochlora* genera.	Known from three locations of the Manchester District of the GMNF – Griffith Lake, Mud Pond and Stamford Stream.

Species	Habitat Requirements	Occurrences (present or historic)
Forcipate emerald *Somatochlora forcipata*	A medium-sized corduline, which inhabits small bog streams. Adult males can be distinguished by the forcipate terminalia. Males are easily discovered while flying along small streams or over nearby dirt roads.	Known from two locations of the Manchester District of the GMNF – Grout Pond seepage, and a wetland near Lost Pond shelter.
Ocellated emerald *Somatochlora minor*	A small corduline inhabiting small slow flowing streams. The paired white circular spots on the sides of the thorax distinguish adults. Males are easily discovered while patrolling at about 1 foot above slow flowing streams.	Known from two locations of the Manchester District of the GMNF – two small streams south of Griffith Lake.
PLANTS		
Agrostis mertensii Arctic bentgrass	Alpine meadows on mountaintops in northern Green Mountains.	Known on Forest only from Lincoln.
Aureolaria pedicularia* Fernleaf yellow false-foxglove	Dry hills, woodland character – oaks in southern VT.	Known on Forest only from Salisbury.
Blephilia hirsuta Hairy woodmint	Rich woodland seeps; two of the three extant populations are associated with trailside seepy areas; often hidden under *Laportea* (nettles); associated with limy soils up to 2500' elevation.	Known in VT only from Forest, in Leicester, Goshen, and Chittenden.
Calamagrostis stricta* ssp. *inexpansa New England northern reed grass	Wet, seepy, limy cliffs, low elevation to subalpine in Green Mountains; possibly limy wetlands at base of limy cliff.	Known on Forest only from Salisbury.
Cardamine parviflora Small-flower bitter-cress	Dry, rocky, sometimes calcareous places at low-mid altitudes.	Known on Forest only from Rochester/Goshen.
Carex aestivalis Summer sedge	Rich-mesic rocky woods, mid-elevations in southern VT.	Known on Forest only from Woodford and Danby.
Carex aquatilis Water sedge	Bogs, fens, wet meadows, pond margins throughout VT.	Known on Forest from Wallingford, Woodford, and Stamford.
Carex argyrantha Hay sedge	Limy cliffs and ledges in western VT.	Known on Forest only from Salisbury.
Carex atlantica Prickly bog sedge	Scattered bogs, wet meadows, and pond margins of VT.	Known on Forest only from Sunderland.
Carex bigelowii Bigelow sedge	Alpine meadows of Green Mountains.	Known on Forest only from Lincoln.
Carex foenea (=aenea) Bronze sedge	Clearings, dry rocks of southern VT (*aenea*); open sands of western VT (*foenea*).	Known on Forest only from Salisbury.
Carex lenticularis Shore sedge	Wetlands, shallow marshes, pond margins.	Known on Forest from Danby, Wilmington, and Stamford.
Carex michauxiana Michaux sedge	Shallow and deep marshes associated with high elevation softwater ponds in southern Green Mountains.	Only known occurrences in VT on Forest, in Mount Tabor, Wallingford, Ripton.
Carex schweinitzii Schweinitz's sedge	Calcareous swamps, wet meadows, low woods, wet ditches; Vermont Valley and Taconics.	Not known from Forest, but occurs within the GMNF Proclamation Boundary.
Carex scirpoidea* Bulrush sedge	High elevation calcareous cliffs scattered throughout VT.	Known on Forest only from Rochester/Goshen

Species	**Habitat Requirements**	**Occurrences (present or historic)**
***Clematis occidentalis* var. *occidentalis* (=*verticillaris*)** Purple clematis	Dry limy woodlands with thin soil or exposed limestone ledges, generally in moderate or full sun, usually in oak woods, generally in western VT.	Known on Forest only from Hancock, historically from Salisbury/Ripton.
Collinsonia canadensis Canadian horsebalm	Rich mesic woods, generally low elevation and southern VT.	Known on Forest only from Bristol.
Conopholis americana Squaw-root	Dry open woods (dry oak-pine, and dry oak-red maple) in southern and western VT.	Known on Forest only from Salisbury and Leicester.
Cryptogramma stelleri Steller's cliffbrake	Shaded cold damp crevices of calcareous cliffs and rocks (limestone or limy schist) scattered throughout VT.	Known on Forest only from Hancock and Mt. Tabor; historic from Dover, Salisbury, Chittenden, and Granville.
Cypripedium parviflorum* var. *parviflorum Small yellow ladyslipper	Limy swamps with conifers, mostly Champlain Valley and southwestern VT.	Known on Forest only from Goshen.
Cypripedium parviflorum* var. *pubescens* Large yellow ladyslipper	Fertile, limy woods with rich, moist soil, under maples, mostly Champlain Valley and southwestern VT.	Known on Forest only from Salisbury.
Cypripedium reginae* Showy ladyslipper	Limy wetlands with conifers, including limy sphagnum bogs and fens, limy wooded conifer swamps, and limy shrub thickets adjacent to wooded swamps; low elevations, generally the big valleys (Champlain, Vermont, Connecticut) in VT.	Known on Forest only from Goshen, historic from Hancock.
Desmodium paniculatum Paniculate tick-trefoil	In VT, associated with dry, low altitude, open woods and woodlands, sometimes oak woods, in VT on limestone or limy schists; generally Champlain Valley in VT.	Known on Forest only from Salisbury, historic also from another site in Salisbury.
Draba arabisans Rock whitlow-grass	Cold limestone cliffs, often moist, in full sun or partial shade, in Vermont associated with Champlain Valley and other limestone areas.	Known on Forest only from Salisbury, also historic there.
Dryopteris filix-mas Male fern	Rich, cool woodlands over calcareous bedrock or other limy substrate, mostly between 1300-2300' elevation; in VT seemingly restricted to an area from Brandon to Woodstock.	Known on Forest (AT Corridor) only from Pomfret and Bridgewater.
Eleocharis intermedia* Matted spikerush	Muddy shores of ponds, scattered throughout VT, although only in circumneutral substrates on Forest.	Known on Forest only from Ripton and Wallingford.
Eupatorium purpureum Sweet joe-pye-weed	Limy, moist woods in central and western VT.	Known on Forest only from Salisbury.
Geum laciniatum Rough avens	Rivershores, damp places, in western VT and tends to be in limy areas; associated with *Polemonium vanbruntiae*.	Known on Forest only from Ripton.
Isoetes tuckermanii Tuckerman's quillwort	Shallow waters on sandy shores of softwater ponds, mostly southern Green Mountains.	Known on Forest only from Wallingford, historic from Stratton and Wilmington.

Species	**Habitat Requirements**	**Occurrences (present or historic)**
Isotria verticillata Large whorled pogonia	Acidic, open woods at low elevation in western VT, generally in oak-hardwood forests on escarpment.	Known on Forest only from Salisbury and Leicester.
Juglans cinerea Butternut	Well-drained, circumneutral, gravelly soils in coves, stream benches, terraces, and talus of rock ledges; sometimes dry soil of limestone origin; generally riparian and below 1500'.	Several current sites on Forest.
Juncus trifidus* Highland rush	Alpine tundra and subalpine cliffs, limited to isolated sites in Green Mountains in VT.	Known on Forest only from Goshen/Rochester.
Lespedeza hirta Hairy bush-clover	Dry open woodlands and openings, in southern and western VT.	Known on Forest only from Salisbury.
Listera auriculata Auricled twayblade	Moist, sandy soils along streams with alder, or circumneutral mucky seeps.	Extant only from Warren off-Forest; historic from Hancock and Sunderland.
Littorella uniflora* American shore-grass	Shores or shallow water of ponds, both soft and moderately hard water, scattered in VT.	Known on Forest only from Wallingford and Mt. Tabor/Peru.
Muhlenbergia uniflora Fall dropseed muhly	Wet meadows and shores; assumed to be more common, but poorly documented, in VT;	Known on Forest only from Stratton, historic from Ripton.
Myriophyllum farwellii Farwell's water-milfoil	Softwater ponds, bog ponds, and slow streams, often at high elevations, southern and northern Green Mtns. (not central).	Unconfirmed from Wallingford on Forest, and historic from Wallingford.
Myriophyllum humile* Low water-milfoil	Mudflats of softwater ponds, bog ponds, southern Green Mountains.	Known on Forest only from Stratton, unconfirmed from Wallingford, on private within Forest in Woodford.
Panax quinquefolius* Ginseng	Rich maple woods and coves: sheltered limestone soils with much humus, moist and in deep shade, scattered in VT.	Known on Forest from 9 stations.
Pellaea atropurpurea Purple-stemmed cliffbrake	Limestone outcrops (often sunny but occasionally in woodlands), generally west of Greens in VT.	Known on Forest only from Salisbury.
Peltandra virginica Green arrow-arum	Shallow water, mud in bogs or lakeshores, in southern and western VT.	Known from Forest only from Woodford/Stamford.
Phegopteris hexagonoptera Broad beech fern	Warm, rich maple or maple-oak woods, generally light, moist soils, on limestone, western VT and lower CT River Valley.	Known on Forest only from Leicester; historic from Salisbury.
Platanthera orbiculata Round-leaved orchis	Either fertile oak woods, usually limy, dry, and low elevation, OR boreal conifer woods, generally moist and mossy, up into subalpine, scattered in VT.	Known on Forest only in Granville and Leicester, with several Forest historic sites.
Polemonium vanbruntiae* Eastern jacob's ladder	Wetlands and seeps, between 350'-1800' elevation; natural seeps with circumneutral muck over sandy sediments;	Extant (and extensive) on Forest only in Ripton, Lincoln.
Potamogeton biculpatus* Snail-seed pondweed	Acid waters, southern VT.	Known on Forest only from Stratton, also in Proclamation Boundary in Jamaica.

Species	Habitat Requirements	Occurrences (present or historic)
Potamogeton confervoides* Tuckerman's pondweed	Shallow water of isolated soft-water lakes, ponds, or shallow depressions.	Known from 7 ponds in Manchester District.
Potamogeton hillii Hill's pondweed	Small, cold, slow, highly alkaline streams and occasionally ponds; in association with limy bedrock, primarily Vermont Valley and Taconics.	Not known from Forest, but occurs within the GMNF Proclamation Boundary.
Prenanthes trifoliolata Three-leaved rattlesnake-root	Cliffs, open woods.	Only extant on Forest and in VT from one site in Salisbury.
Pyrola chlorantha (=virens) Green pyrola	Limy woods, moderate elevations, and limy swamps at lower elevations, scattered in VT.	Known on Forest only from Leicester.
Ribes triste Wild red currant	Limy softwood swamps, and subalpine woods and ravines, especially on lime, scattered in VT.	Known on Forest only from Goshen, historic from Wilmington, Mt. Tabor, and Stratton.
Saxifraga paniculata (=aizoon) White mountain saxifrage	Cold, high elevation limestone cliffs, only 5 isolated sites in VT.	Known on Forest only from Rochester/Goshen.
Scheuchzeria palustris* ssp. *americana* Pod-grass	Sphagnum bogs and boggy margins of ponds, often limy, primarily southern and western VT.	Known on Forest only from Winhall, several historic from Wallingford and Sunderland.
Scirpus subterminalis Incomplete bulrush	Softwater ponds and sphagnum bogs, to moderate elevations, scattered in VT;	Known on Forest only from Mt. Tabor/Peru, Jamaica within Proclamation Boundary, and historic from Stratton.
Sedum rosea* Roseroot stonecrop	Subalpine limestone cliffs and rocks, exposed or shaded, often wet.	Only known from two sites in VT, one on Forest in Rochester/Goshen.
Selaginella rupestris Rock spikemoss	Dry, warm rocks, usually schist or quartzite, occasionally lime, in full sun or partial shade, generally low elevations in oak zone; mostly Champlain and lower CT River Valleys.	Known on Forest only from Wallingford, unconfirmed from Bristol, and historic from Salisbury.
Sisyrinchium angustifolium* Narrow blue-eyed grass	Wet meadows, low woods and thickets, damp shores, scattered in VT.	Known on Forest only from Lincoln.
Sisyrinchium atlanticum* Eastern blue-eyed grass	Meadows (damp or dry), swales, marshes, low woods, historic in southern VT; may be overlooked.	Only extant station in VT is on Forest in Hancock, historic in Stratton.
Solidago squarrosa Stout goldenrod	Open to partial shade (e.g. woodlands), dry soil, convex landforms, or outcrops of weathered, disintegrating rocks (e.g. slates, sandstones, granites), scattered in VT.	Known on Forest only from Rochester/Goshen.
Sorbus decora Northern mountain-ash	Subalpine woods, often with lime, generally in Green Mtns in VT.	Known on Forest from Rochester/Goshen, Lincoln, Sherburne, and Mendon.

Species	Habitat Requirements	Occurrences (present or historic)
Sparganium fluctuans* Floating bur-reed	Tannic water ponds scattered in VT.	Known on Forest from sites in Wallingford, Mt. Tabor, Weston, Peru, Sunderland, unconfirmed at Stamford and Woodford.
***Torreyochloa pallida* (=*Glyceria fernaldii*)** Fernald alkali grass	Pools, marshes bordering streams, floating bog mats on softwater ponds, scattered in VT.	Known on Forest only from Ripton and Sunderland.
Utricularia geminiscapa* Hidden-fruited bladderwort	Softwater ponds, in Green Mountains.	Known on Forest from Sunderland, Winhall, within Proclamation Boundary in Woodford, Searsburg.
Utricularia resupinata* Northeastern bladderwort	Sandy, muddy, or peaty shores of mountain softwater ponds; scattered in VT.	Known on Forest only from Stratton, historic from Jamaica
Uvularia perfoliata Perfoliate bellwort	Rich, dry, calcareous woodlands, generally in western VT.	Known on Forest only from Salisbury.
Vaccinium uliginosum Alpine bilberry	Alpine and subalpine ledges, scattered on isolated mountaintops in northern VT.	Known on Forest only from Lincoln.
Woodsia glabella* Smooth woodsia	Cold, limestone cliffs, partial sun or shade, often wet and sheltered; also in limy talus at top of ledges, scattered, isolated cliffs in VT.	Known on Forest only from Rochester/Goshen.

* Species currently found in Tables E.01 or E.02 of Forest Plan.

Table 3. – Review of GMNF Forest Plan "Recommended Sensitive" species not carried forward by the GMNF onto the 2000 update of the RFSS list (USDA 2000a).

Species	Habitat Requirements	Likelihood of Occurrences (present or historic)
Loggerhead shrike *Lanius ludovicianus*	Nesting habitat includes pastures with scattered thorny trees, such as hawthorn (*Crataegus* spp.) and eastern red cedar (*Juniperus virginiana*).	Not known or likely to occur within the GMNF.
Long-tailed shrew *Sorex dispar*	Primary habitat is among rocks, especially talus slopes, and adjacent to cold mountain streams.	Not known or likely to occur within the GMNF.
New England cottontail *Sylvilagus transitionalis*	Currently restricted to disturbance patches where secondary succession has progressed for 10-25 years.	Not known or likely to occur within the GMNF.

Analysis of Effects

This section will be divided between general effects on all sensitive species as a group, and those effects that are associated with specific species groups, followed by effects on species no longer considered sensitive.

All Sensitive Species

Affected Environment

The affected environment for all sensitive species as a group involves their status as newly designated RFSS, in comparison to their status in the current Forest Plan, as well as any goals, objectives, standards, and guidelines that pertain to this class of species, rather than individual species. The GMNF identified 87 species for inclusion on this Regional list, which is broken down by taxonomic group in Table 4. Table 5 displays, for all current GMNF sensitive species, or species identified as RFSS in the Forest Plan, a comparison between the current Forest Plan classification of protected species, the previous classification of RFSS in 1994, and the classification resulting from the updated RFSS list.

Table 4 - Breakdown of GMNF's Sensitive Species

Species Group	Number of Sensitive Species
Animals	**21**
Mammals	1
Birds	3
Amphibians	1
Reptiles	1
Mollusks	2
Insects	13
Plants	**66**
Ferns and Fern Allies	7
Dicots	28
Monocots	31
Total Number	**87**

Together, the 87 sensitive species are associated with most habitats found on the GMNF, including ponds, streams, wetlands, openings, rock outcrops, cliffs, caves, alpine areas, spruce-fir forest, northern hardwood forests (including mixed conifer hardwood and rich hardwood variants), and dry oak and hardwood forest variants. Assessment of how well the current Forest Plan direction provides for protection of known or likely RFSS occurrences can best be made first through a general review of effects that are consistent across all species, and then by grouping these species by the habitats with which they are associated, and then determining how well the Forest Plan guides management of those habitats. Species and habitats have been grouped below following the general effects discussion, and further details regarding affected environment and species impacts are discussed in that context.

Factors that tend to limit these sensitive species, at a species level, are usually environmental, and such factors are discussed below under species habitat groups. However, there are factors that are more administrative that still have the potential to impact species, through their effects on sensitive species as a protected class or group. There are three general administrative factors that can limit the maintenance of these species on the Forest.

Protection - First, the lack of language in management plans that provides protection for any species classified as sensitive may lead to impacts to species during ground-disturbing projects. This disturbance can potentially extirpate a species from a site. Protection language in FSM 2670, which provides policy direction for RFSS management, tends to mitigate this factor.

Adaptive Management - Second, the Forest Plan serves to represent our management principles in a format that the public can observe easily, and on which we report and are accountable to the public. If the Forest Plan becomes outdated, then our actions become out of sync with the Forest Plan, and the public becomes confused over our program objectives. Forest Plans can become outdated quickly in regards to rare species, as new information regularly becomes available that can change our understanding of the status of and risks to these species. This data is then used to revise state and federal lists, and update the Forest's approach to management for rare species. If forest management remains adaptive, but such changes in management strategies are not incorporated into Forest Plans, the ability to communicate with the public and more effectively generate interest and credibility in rare species conservation is diminished.

Table 5 – Comparison of changes to RFSS designations from the 2000 update with the 1994 RFSS list, and the 1987 Forest Plan designations (Tables E.01-E.03), including only those species that are currently designated sensitive for the GMNF, or those designated as sensitive in the Forest Plan.

Scientific Name	Common Name	2000	1994	1987
2000 REGIONAL FORESTER'S SENSITIVE SPECIES				
PLANTS				
Agrostis mertensii	Arctic bentgrass	S		
Aureolaria pedicularia	Fernleaf yellow false-foxglove	S		SC
Blephilia hirsuta	Hairy woodmint	S		
Calamagrostis stricta ssp inexpansa	New England northern reed grass	S		
Cardamine parviflora	Small-flower bitter-cress	S		
Carex aestivalis	Summer sedge	S		
Carex aquatilis	Water sedge	S		
Carex argyrantha	Hay sedge	S		
Carex atlantica	Prickly bog sedge	S		
Carex bigelowii	Bigelow sedge	S		
Carex foenea (=aenea)	Bronze sedge	S		
Carex lenticularis	Shore sedge	S		
Carex michauxiana	Michaux sedge	S		
Carex schweinitzii	Schweinitz's sedge	S	S	
Carex scirpoidea	Bulrush sedge	S		SC
Clematis occidentalis var. occidentalis	Purple clematis	S		
Collinsonia canadensis	Canada horse-balm	S		
Conopholis americana	Squaw-root	S		
Cryptogramma stelleri	Steller's cliffbrake	S		
Cypripedium parviflorum var parviflorum	Small yellow ladyslipper	S		
Cypripedium pubescens (=parviflorum var pubescens)	Large yellow ladyslipper	S		SC
Cypripedium reginae	Showy ladyslipper	S		SC
Desmodium paniculatum	Paniculate tick-trefoil	S		
Draba arabisans	Rock whitlow-grass	S		
Dryopteris filix-mas	Male fern	S		SC
Eleocharis intermedia	Matted spikerush	S		SC
Eupatorium purpureum	Sweet joe-pye-weed	S		
Geum laciniatum	Rough avens	S		
Isoetes tuckermanii	Tuckerman's quillwort	S		
Isotria verticillata	Large whorled pogonia	S		
Juglans cinerea	Butternut	S	S	
Juncus trifidus	Highland rush	S		SC
Lespedeza hirta	Hairy bush-clover	S		
Listera auriculata	Auricled twayblade	S	S	
Littorella uniflora	American shore-grass	S		SC
Muhlenbergia uniflora	Fall dropseed muhly	S		
Myriophyllum farwellii	Farwell's water-milfoil	S		
Myriophyllum humile	Low water-milfoil	S		SC

Scientific Name	Common Name	2000	1994	1987
Panax quinquefolius	American ginseng	S		SC
Pellaea atropurpurea	Purple-stemmed cliffbrake	S		
Peltandra virginica	Green arrow-arum	S		
Phegopteris hexagonoptera	Broad beech fern	S		
Platanthera orbiculata	Round-leaved orchis	S		
Polemonium vanbruntiae	Eastern jacob's ladder	S	S	S
Potamogeton biculpatus	Snail-seed pondweed	S		SC
Potamogeton confervoides	Tuckerman's pondweed	S	S	SC
Potamogeton hillii	Hill's pondweed	S	S	
Prenanthes trifoliolata	Three-leaved rattlesnake-root	S		
Pyrola chlorantha (=virens)	Green pyrola	S		
Ribes triste	Wild red currant	S		
Saxifraga paniculata (=aizoon)	White mountain saxifrage	S		SC
Scheuchzeria palustris ssp americana	Pod-grass	S		SC
Scirpus subterminalis	Incomplete bulrush	S		
Sedum rosea	Roseroot stonecrop	S		SC
Selaginella rupestris	Rock spikemoss	S		
Sisyrinchium angustifolium	Narrow blue-eyed grass	S		SC
Sisyrinchium atlanticum	Eastern blue-eyed grass	S		SC
Solidago squarrosa	Stout goldenrod	S		
Sorbus decora	Northern mountain-ash	S		
Sparganium fluctuans	Floating bur-reed	S		SC
Torreyochloa pallida (=Glyceria fernaldii)	Fernald alkali grass	S		
Utricularia geminiscapa	Hidden-fruited bladderwort	S		SC
Utricularia resupinata	Northeastern bladderwort	S		SC
Uvularia perfoliata	Perfoliate bellwort	S		
Vaccinium uliginosum	Alpine bilberry	S		
Woodsia glabella	Smooth woodsia	S		SC
MAMMALS				
Myotis leibii	Eastern small-footed myotis	S	S	S
BIRDS				
Catharus bicknellii	Bicknell's thrush	S		
Falco peregrinus anatum	American peregrine falcon	S	LE	LE
Gavia immer	Common loon	S		S
AMPHIBIANS				
Ambystoma jeffersonianum	Jefferson salamander	S		
REPTILES				
Clemmys insculpta	Wood turtle	S		
MOLLUSKS				
Alasmidonta varicosa	Brook floater	S	S	
Lasmigona compressa	Creek heelsplitter	S		
INSECTS				
Aeshna tuberculifera	Black-tipped darner	S		
Aeshna verticalis	Green-striped darner	S		

Scientific Name	Common Name	2000	1994	1987
Arigomphus furcifer	Lilypad clubtail	S		
Calopteryx amata	Superb jewelwing	S		
Cicindela marginipennis	Cobblestone tiger beetle	S		
Gomphus (=Phanogomphus) descriptus	Harpoon clubtail	S		
Gomphus adelphus	Mustached clubtail	S		
Lanthus vernalis	Southern pygmy clubtail	S		
Lestes eurinus	Amber-winged spreadwing	S		
Ophiogomphus (=Ophionurus) mainensis	Maine snaketail	S		
Somatochlora elongata	Ski-tailed emerald	S		
Somatochlora forcipata	Forcipate emerald	S		
Somatochlora minor	Ocellated emerald	S		
FOREST PLAN SENSITIVE SPECIES REMOVED FROM 2000 RFSS LIST FOR GMNF				
MAMMALS				
Sorex dispar	Long-tailed shrew			S
Sylvilagus transitionalis	New England cottontail		S	S
BIRDS				
Lanius ludovicianus	Loggerhead shrike	R9S		S

Key
S = listed on RFSS list of that year
SC = listed as "Species of Concern"
U = listed as "Species of Uncertain Occurrence"
LT = listed as “Threatened” under ESA
LE = listed as “Endangered” under ESA
R9S = listed as RFSS in 2000 but not RFSS for the GMNF

Inventory and Monitoring - Third, the lack of effective objectives in management plans for monitoring and inventory of sensitive species can lead to undetected species losses. In many cases, those losses may either be part of the natural variation in a species' ecology (e.g. for opportunistic species), or they may indicate significant changes in a species' ecology (such as changes in habitat conditions or predation patterns). In either case, there are times when intervention would be meaningful, and other times when it wouldn't. Not detecting the loss, however, provides no option for intervention. In fact, many species are placed on protected lists simply because their low numbers suggest vulnerability (i.e. loss of one of only two known populations of a species on the Forest could easily lead to extirpation from the area of interest). Some of these species may be truly vulnerable, while others may have population dynamics or ecologies that enable persistence in small numbers. Without monitoring and inventory objectives, declines are unlikely to be detected, population dynamics and ecologies are not researched, understanding is diminished, and some species may be lost.

Direct and Indirect Effects
Protection - The current Forest Plan recognizes sensitive species as a protected group (1987, 4.35; E.02), has a specific goal to protect such species (1987, 4.05), recognizes their designation by the Regional Forester (1987, 4.35), has specific guidelines for some sensitive species (1987, 4.35-4.37; E.02-E.05), and provides general direction for these species within the management guidelines of the current Forest Plan (1987, 4.10, 4.35-4.37; E.01-E.07). Protection objectives, however, are limited to peregrine falcons, and inventory of rare plants in places threatened by disturbance (1987, 4.10). There are no protection objectives defined that gather information about species in their most likely habitat (which is

often not where threatened by disturbance), and no objectives regarding what is done to protect species that are found. Although guidelines do exist to develop site-specific protection for rare plants when there are conflicts between projects and species occurrences, there are no quantifiable protection objectives, for the full range of sensitive species, that address the viability concerns for these species (i.e. where such concerns are not limited to site-specific disturbance). For instance, there are no objectives related to development of Conservation Assessments or Strategies, which directly address such viability concerns and provide the needed analysis for development of Forest Plan direction for these species.

Protection of sensitive species based on the goals, objectives, standards, and guidelines noted above in the Forest Plan has proven somewhat successful, however. One of the key elements of this direction is the development of site-specific plans when rare plants are found in or near a project (1987, 4.35; E.05). Such site plans, developed with other resource specialists and cooperators for a particular location, have proven to be useful in two ways. First, they provide a vehicle for increasing understanding of the problems facing rare species by developing cooperative relations with others – this has led not only to greater sensitivity to rare species, but also to increased interest in monitoring rare species. Second, because we often know very little about rare species ecology, working with researchers and others to design a protection plan for a certain site helps build our knowledge regarding species responses to change in those conditions. This empirical knowledge will ultimately contribute to development of conservation strategies that can be standardized for inclusion in the Forest Plan. For most of these sensitive species, inclusion of additional standards and guidelines at this point would be premature due to lack of information, and would add no guarantee of success beyond that which comes with the standards and guidelines currently being implemented on a site-by-site basis under the existing Forest Plan.

However, the Forest Plan could be strengthened by the addition of specific resource protection objectives that benefit all sensitive species. Such objectives include a defined number of acres inventoried/year for sensitive species, without constraining that inventory to only places of management conflict; and an annual compilation and reporting on the number of new sensitive species occurrences found on the Forest, as well as the number of biological evaluations prepared and the number of sensitive species occurrences protected through project mitigation. In addition, including a protection objective of preparing at least one sensitive species or species group conservation assessment per year will help us be accountable to our stewardship role in not only protecting species sites, but also in improving their conditions such that these species will either continue to be maintained (considering their natural distribution, abundance, and the range of limiting factors the Forest can control), or will cease to be of viability concern.

Without these additional objectives, while our management has served to protect species occurrences, the bulk of our efforts will remain reactive, responding to threats. Beyond the policy within FSM 2670 to develop conservation assessments, strategies, and agreements, there is nothing in the Plan that identifies how we will redeem that responsibility. Consequently, such efforts will remain ad hoc, limited in scope, and subject to Forest discretion in the face of other actions mandated by the Forest Plan. In addition, it is difficult to be accountable for actions that are not quantified or quantifiable, and so building quantifiable objectives for the sensitive species group as a whole into the Forest Plan will provide a more effective accountability mechanism.

Adaptive Management - The current Forest Plan is very outdated in regards to how potential sensitive species are evaluated and designated, and is confusing in regards to how direction for all protected species, including sensitive species, is organized among the two sections of the Forest Plan that address these species (1987, 4.28-4.37; app. E). This was pointed out in the last Monitoring and Evaluation Report. The protected species lists in the Forest Plan (1987, E.04, E.06-E.07) are very old and inaccurate, and in fact are likely to remain inaccurate as updates to the Federal, Regional, and State lists change faster than we are able to update the Forest Plan. Our actions for species protection address sensitive species that are not listed in the Forest Plan; and so the public will continue to be confused about why and how the list changes, what is on the list, and how they can participate in either changing the list or contributing towards conservation efforts. Ultimately, the confusion can lead to lack of credibility for the program, and species loss through lack of interest and support. We don't anticipate this outcome in the near future due to our continued strong working relationships with rare species conservation organizations and the State of Vermont. However, the continued divergence between the Forest Plan language and what is implemented will lead to much greater reliance on personal relationships with partners to maintain a credible program.

In addition, the Forest Plan is not clear on how new information on species occurrences is dealt with in terms of protections afforded new species during their evaluation for and prior to their listing as RFSS. With the new direction in the FSM regarding how sensitive species are evaluated and designated, it is not clear if species discovered on the GMNF that are RFSS for other Forests are automatically afforded sensitive species protections while the formal evaluation process is going on – although it is likely they are not afforded any more protection than species not currently RFSS. Consequently, during the evaluation and approval process, these species could be vulnerable to impacts from projects. However, it is Forest Service policy to assist states in meeting their conservation objectives (FSM 2670.32), and so it is highly unlikely that we would ignore these new occurrences or otherwise take actions that would knowingly threaten their continued viability. Additional direction in the Forest Plan providing some level of protection for newly discovered species on the Forest would mitigate any possible impact.

Inventory and Monitoring - The current Forest Plan recognizes the need to monitor the values of Special Areas, some of which include rare species (1987, C.07). The Forest Plan also defines a resource protection objective of inventory of rare plants where threatened by site disturbance (1987, 4.10; Amendment 2). However, beyond this objective, there are no quantifiable objectives regarding inventory or monitoring for any, or all sensitive species within their most likely habitats (although there is guidance in Appendix E to develop potential habitat maps for protected plants (1987, E.05)).

Given the state of our knowledge regarding rare species' ecology, it is unrealistic to expect that potential habitat maps developed in an office will be more than marginally successful at predicting rare species occurrence. This has been demonstrated over and over in our attempts to use maps developed for us by knowledgeable botanists and ecologists. Every iteration of such maps incorporates new information that leads to identification of new areas considered potential habitat for rare species. The greatest limitation these maps have is the lack of routine field validation of both the occurrence of the presumed habitat, and its suitability. Inventories have tended to be either project related (where potential habitat is usually limited), or one-time broad scale efforts that do not then re-evaluate initial assumptions upon completion of the inventory. More times than not, we have found that such broad efforts result in changes to our assumptions about what habitats rare species inhabit, or the models used to predict where the habitat conditions occur. These valiant efforts over the past 20 years, more than anything else, suggest a need for a more routine, annual, inventory program for sensitive species that seeks to understand habitat relationships as well as predictions of where habitats occur, and one that is not predicated on the threat of disturbance, nor on an unrealistic or unattainable inventory goal (e.g. 35,000 acres/year).

Regarding monitoring, we currently have approximately 50 new sites having occurrences of sensitive species, none of which have Forest Plan monitoring expectations, and 87 sensitive species with no species monitoring expectations except for peregrine falcon. Without Forest Plan monitoring expectations regarding either individual sensitive species or species groups, such work will remain a low priority, and there will be no mechanism (i.e. the annual Monitoring and Evaluation Report) to formally report on how these populations are doing. The Forest has been working closely over the years with the Vermont Department of Fish and Wildlife and the New England Plant Conservation Program (NEPCoP) to coordinate volunteer monitoring efforts, but for the most part this has been extremely limited on the Forest, and has tended to focus on high profile species (e.g. common loon) that can support volunteer interest. Without the interest of volunteers and these organizations, there would be no monitoring of these sensitive species populations, which is likely to lead to undetected losses of some populations.

However, in spite of these deficits, there are some notable actions that the GMNF has taken over the last 13 years within the context of Forest Plan goals and objectives for sensitive species described above. As a result of implementing the protection guidelines, Special Area monitoring, and rare plant inventory since 1987, new sites for sensitive species have been located, known sensitive species occurrences have been protected where found in project locations, and most Special Areas with sensitive species have been monitored at least once in cooperation with the State of Vermont and others. Specific actions that have contributed to the protection and understanding of all sensitive species distribution and habitat needs include:

- Development and implementation of a Challenge Cost-Share Agreement with the Vermont Nongame and Natural Heritage Program (VNNHP) between 1991-1997 to identify and inventory high, moderate, and low potential habitat for rare plants and animals on the National Forest. A total of 469 potential or known sites were identified within the proclamation boundary, of which 293 occurred wholly or in part on federal land managed by the GMNF. Of these 293 potential sites, VNNHP and GMNF staff visited a total of 193. From these visits and other sites already well documented, a total of 74 sites on the GMNF were identified as having statewide ecological significance, including 15 areas already designated in the Forest Plan as (Management Area) MA 8.1. Many, but not all, of these sites represent locations of rare or uncommon plants and animals.

- Since 1992, all projects proposing new ground-disturbance are reviewed for potential rare plant habitat using the most current habitat maps, and those projects with potential or uncertain habitat are field reviewed for rare plants. In some cases, if the habitat can be avoided or buffered, no field visits are made (e.g. wetlands). Generally about 5% of these field surveys turn up either rare plants or suitable habitat, and the effects of the projects on these populations or habitats are documented in biological evaluations, per direction in FSM 2670. In most cases, habitat or occurrences are avoided; on occasion, mitigation measures which time the activity to occur outside the growing or breeding season are used, and then populations are monitored. These project surveys since 1997 have added 5 rare species sites to those identified with the VNNHP inventory. These project surveys have also led to the conclusion that small patchy habitats are often missed in our habitat maps, and so our concept of "potential" habitat has widened to ensure we survey areas that may have inclusions of potential habitat.

The Forest continues to struggle with attaining adequate resources to protect and monitor all RFSS; updates to the Forest Plan won't change this problem. However, not including updated information and more appropriate objectives in the Forest Plan will reduce our ability to effectively advocate for additional inventory, monitoring, and research on RFSS (through volunteer organizations, stewardship contracts, etc.). The Forest Plan continues to support project and Special Area surveys and monitoring for sensitive species, as well as maintenance and cultivation of strong relationships with partners interested in rare species conservation. Implementing existing Forest Plan guidance will control most of the limiting factors that the GMNF can influence in sensitive species habitats.

Cumulative Effects

For the purposes of this evaluation, the Forest Plan defines past, present, and reasonably foreseeable future actions. As discussed earlier, such actions as have been taken to protect RFSS will likely continue, as will partnerships with State agencies and conservation organizations with an interest in rare species conservation. The continued divergence of the Forest Plan language from actual TES policy, objectives and accomplishments will eventually lead to problems with credibility. Credibility will become increasingly dependent upon the good will relationships of Forest TES program managers with partners. Without more precise goals and objectives in the Forest Plan for RFSS, we will be less accountable to the public for rare species conservation, which has lately been less acceptable than in 1987, and is likely to continue to be of concern. Species may decline without detection, although most likely due to factors beyond GMNF control. Overall, however, the handful of gaps in the Forest Plan are not likely to jeopardize the existence of any of the RFSS, as we do not anticipate any great changes in Forest Plan implementation or program direction prior to Forest Plan revision.

High Elevation, Cliff, and/or Rock Outcrop Dwellers

Affected Environment

This habitat includes cliffs, rock outcrops, ledges, talus, and caves (and associated vegetation) that may occur across the elevational gradient of the Forest, but tends to be associated either with alpine/krummholtz zones at high elevation, or escarpment communities at around 1500' elevation along western edge of the National Forest. Isolated patches of this habitat are widespread across the Forest, and are mapped for the Forest on Ecological Land type (ELT) maps. Known sites documented in the Forest Plan include White Rocks Cliffs, Mount Horrid, Rattlesnake Point, and Mount Abraham. Additional sites of this habitat are recognized by the State of Vermont but currently have no formal recognition in the Forest Plan. Such sites will be evaluated during Forest Plan revision for special designation.

Species known to occur in association with this habitat are listed here (specific habitat requirements are detailed in Table 2):

Eastern small-footed bat
American peregrine falcon
Bicknell's thrush
Arctic bentgrass
Fernleaf yellow false-foxglove
New England northern reed grass
Small-flower bitter-cress
Hay sedge
Bigelow sedge
Bulrush sedge
Purple clematis
Steller's cliffbrake
Rock whitlow-grass
Highland rush
Purple-stemmed cliffbrake
White mountain saxifrage
Roseroot stonecrop
Rock spikemoss
Stout goldenrod
Alpine bilberry
Smooth woodsia

The factors that most limit these populations to very few (leading to viability concerns) are habitat amount, size, and distribution. These habitats occur either as discrete, small patches in the landscape, only very few of which provide the characteristics making them suitable (substrate, light conditions, moisture) for these species, or they occur as long, narrow, linear bands associated directly with a geologic substrate or climatic zone, both of which are limited on the Forest. Given the patchy nature of the habitat, dispersal of seed or individuals across hundreds of acres of unsuitable habitat towards a small patch of suitable habitat is a risky affair at best. In the case of species associated with the dry, warm version of this habitat, fire may have been a mechanism to maintain these habitats. Such a disturbance regime in the escarpment ecosystem of the western Green Mountains has received limited study, but one such study suggests a return interval of approximately 150 years (Mann et al. 1994). To perpetuate the desired habitat such fires would have to reduce most of the accumulated organic matter to create a substrate limited enough to expose rock and reduce competition from hardwoods. Changes in climate and/or disturbance regime that lead to system-level changes of these habitats to closed forest is the long-term concern, and is of most concern in the alpine/krummholtz areas on the Forest and along the escarpment ecosystem in places where there are not long vertical cliff faces. In some cases, forest management can stall the inevitable changes that result from climate change, but at significant costs in resources that will likely increase over time. Forest management in these areas has the potential to reestablish disturbance regimes that have been removed, but the inaccessibility and extreme nature of much of this habitat limits the use of conventional methods. Consequently, these factors (loss of disturbance regime and climate change) in these habitats tend to be beyond the control of forest management, as a practical matter (but see also the "Species of Dry, Low Elevation Woods" group below).

Activities on the Forest that increase or encourage access to this habitat can negatively impact species associated with the habitat by increasing trampling and erosion, changing microclimate, and harassing nesting, roosting, or hibernating species such that these individuals cannot breed, or have reduced survivability. Activities such as removal of trees within or adjacent to the habitat can change light, temperature, and moisture regimes, either to the detriment or benefit of some species (e.g. fern-leaved yellow foxglove requires open, dry habitat while New England northern reed grass requires wet, cool habitat – both occur on the same cliff at the same site, only at different microsites along the cliff). Introduction of fire in the escarpment habitats may contribute to persistence of this habitat and associated species, but runs the risk of eliminating the targeted species if not done carefully or if done with weak populations.

Direct and Indirect Effects

Much of our current Forest Plan direction for this habitat can be found in chapter 4, under the discussion of Management Prescription 8.1 (Special Areas). Page 4.160 describes protective management at White Rocks cliffs for peregrine falcons; page 4.164 describes the Mt. Horrid community and its management; page 4.169 addresses the alpine/sub-alpine environment of Mount Abraham; and 4.171 gives protective direction for the Rattlesnake Point area. In addition to this guidance, specific guidance can also be found on pages 4.34-4.35 for the peregrine falcon. Guidance for review of vegetation management or road construction in areas considered steep, having shallow soils, or in the alpine zone is located on page 4.22.

We acknowledge that given the extent to which the distribution of this habitat is controlled by climatic and geologic characteristics that are rare on the Forest, we cannot influence these factors in any meaningful way through our actions. For those species that are tightly linked to these characteristics, they are likely to remain of viability concern for the foreseeable future, even if all other limiting factors we can control are improved. Consequently, those factors within our control are generally protective, with the opportunity for reintroduction of species or disturbance regimes in isolated circumstances where research has indicated efficacy of these techniques in these habitats.

As a result of Forest Plan implementation since 1987, these habitats have been protected, and in the case of peregrine falcon our actions have contributed to the delisting of the species from the Endangered Species list. Forest Plan and Forest actions that have provided for ecological conditions needed to maintain these species or improve their viability, considering the natural distribution and abundance of both the species and associated conditions, include:

- Successful implementation of a peregrine falcon hacking program at Mount Horrid and White Rocks.
- The design and implementation of a monitoring plan for Mount Abraham's rare plants with the State of Vermont, which detected the near loss of Alpine bilberry from the site in 1991. The GMNF worked with partners to employ summit stewards and design of a roped-off restricted area at the summit, which eliminated trampling of alpine bilberry at the site, and contributed to its dramatic rebound detected during monitoring in 1996.
- Contract with Jerry Jenkins to monitor the rare plant populations at Mount Horrid in 1991 and 1995; both surveys relocated species that had not been seen at the site for over 25 years (mostly due to lack of survey).
- Closure in FY 2000 of the Devil's Den site, where severe erosion on cliffs has occurred due to heavy use by recreationists. This site has a known occurrence of a sensitive plant.
- Worked with the State of Vermont to and Vermont Institute of Natural Science (VINS) to monitor Bicknell's thrush habitat/populations and to develop a Conservation Assessment for the species.
- Cooperated with the State of Vermont and The Nature Conservancy to protect habitat quality of the one hibernaculum owned by the Forest (gated at the adit).

The risk associated with continued implementation of the Forest Plan as written appears low for species of these rocky habitats. Standards and guidelines that exist in the Plan have been used to protect potential habitat where such habitat could not be surveyed; where surveys have been conducted and sensitive species found, site-specific plans have been developed to eliminate or mitigate conflicts. Closure orders have been used for both plants and animals (e.g. peregrine falcon and steller's cliffbrake) when recreation use was found to pose a threat to persistence of the species. Where eliminating use conflicts with other primary objectives at a site (e.g. recreation use at Mount Abraham), limited closures using roped-off areas has been shown to improve the condition of rare species.

Cumulative Effects
We don't anticipate any additional cumulative effects beyond those discussed above for the entire RFSS group.

Lake and Pond Dwellers

Affected Environment
This habitat includes permanent waterbodies of various sizes and at various elevations. It also includes near-shore habitat that is directly affected by the waterbody, such as the mud shores of bog ponds. Many of these ponds are concentrated in the southern Green Mountains on the Manchester District, both as high elevation ponds and as smaller ponds nested within wetland complexes. Ponds recognized in the Forest Plan as ecologically significant include all of those identified under MA 8.1K (Griffith Lake, Branch, Little, Skylight, Big Mud, Little Mud, Wallingford, Fifield, Little Rock, and Abbey Ponds), as well as Grout Pond, and Lost Pond (within White Rocks NRA). Additional ponds on the Forest have since been identified by the State of Vermont as having ecological significance, but currently have no formal recognition in the Forest Plan. Currently all such pond sites are mapped based on the VNNHP's significant ecological features inventory.

Species known to occur in association with this habitat are listed here (specific habitat requirements are detailed in Table 2):

Common loon
Black-tipped darner
Green-striped darner
Lilypad clubtail
Amber-winged spreadwing
Ski-tailed emerald
Water sedge
Prickly bog sedge
Shore sedge
Michaux sedge
Matted spikerush
Tuckerman's quillwort
American shore-grass
Farwell's water-milfoil
Low water-milfoil
Green arrow-arum
Snail-seed pondweed
Tuckerman's pondweed
Hill's pondweed
Pod-grass
Incomplete bulrush
Floating bur-reed
Fernald alkali grass
Hidden-fruited bladderwort
Northeastern bladderwort

The factors that tend to influence the integrity of these habitats and the rare species occurrences within them are varied. As for the rock habitats, these habitats tend to occur as isolated small patches in the landscape, especially in the northern Green Mountains. Consequently, dispersal is more limited for species associated with these ponds. However, in the southern Green Mountains, these small patches are clustered in much closer proximity to each other than elsewhere on the Forest. Climatic change and acidic deposition both have effects on the integrity of these habitats; recent water quality monitoring of many ponds on the Forest indicates poor quality due to atmospheric deposition of sulfur and nitrogen, leading to what is considered critical acidification of many of these waterbodies by Vermont water quality standards (USDA 2000c). However, most of the species associated with these ponds prefer the acid waters to more neutral conditions (the exceptions being Hill's pondweed and to some extent Pod-grass). It is unclear for the species of acid waters if there is a lower limit to acidity preferences.

An important factor affecting these ponds is fluctuating water levels in association with periodic beaver occupation. It has been well known anecdotally that beaver impoundments, especially repeated in the same pond or wetland, can destroy the integrity of boggy margins that have developed over decades or centuries and hold the most significant potential for rare plant habitat in these environments (Jenkins 1989). It has also been documented that beaver populations continue to expand, and have the ability to create habitat suitable for their needs most anywhere there is a water source (Grove 1994). This is a particularly complicated factor, however, as most original sightings of these rare aquatic plants came from the late 19th and early 20th centuries, after beaver had been extirpated from Vermont (in the 1860s). Subsequent beaver reintroduction has restored an original component to these systems, but we do not have any information regarding the status of these rare plants during the 100's of years of co-habitation with beaver prior to it's extirpation. The assumption we are currently following is that these rare plants were adapted to the variation in habitat availability and suitability that came with pre-historic beaver occupation cycles, and so allowing beaver to occupy any suitable habitat is not a threat to the long-term persistence of these species. Monitoring both beaver and these pond-dwelling species will help determine if this assumption is valid.

Limiting factors well within GMNF control are associated with changes to water quality, including sedimentation, water temperature, and pollutants; as well as human disturbance of shoreline nesting habitat. These factors can be made limiting through poorly designed and implemented timber harvesting and road building, as well as recreational use (foot traffic as well as motorized traffic), especially along the shores and at access points to the ponds. These activities can increase sediment flow into the ponds, blocking sunlight and burying aquatic species; these activities also have the potential to change the light regime along the shoreline by removing canopy trees that provide shade, regulate temperature, and contribute woody debris. In addition these activities have the potential to introduce pollutants and invasive species into these pond systems, further reducing the integrity of the habitat. Also along the shoreline, recreation use during the breeding season for common loon can disrupt nesting and potentially lead to nest abandonment and loss of brood.

Direct and Indirect Effects

Much of our current Forest Plan direction for this habitat can be found in chapter 4, under the discussion of Management Prescription 8.1 (Special Areas). Page 4.170 describes protective management for 10 high elevation ponds, in particular Branch and Little Ponds; pages 4.159-4.160 describe management direction for the ponds found in the White Rocks NRA (Lost, Big Mud, Little Mud, Wallingford, Little Rock, and Fifield Ponds, and Griffith Lake); pages 4.161 – 4.162 address the management of Grout Pond; page 4.168 gives protective direction for the Abbey Pond/Beaver Meadows area; and pages 4.117-.4.122 provide the general management philosophy for Wilderness that applies to Skylight Pond. The current Forest Plan also reflects the recognition that water quality is to be protected on the GMNF (1987, 4.19-4.26). Page 4.34 displays guidance for management of ponds to "favor natural ecosystems and indigenous species". Pages 4.35 and E.03 give specific direction for the common loon (the one RFSS "holdover" from this group with species-specific guidance).

Timber sale monitoring for implementation of soil and water standards and guidelines indicates that these standards and guidelines are implemented most of the time, and when implemented they are almost 100% effective in protecting soil and water resources (USDA 2000c). Such results indicate that the existing standards and guidelines for protection of water quality likely protect many of the water quality needs of these species.

Of the 15 new RFSS that rely upon lakes and ponds, five are Odonates (dragonflies or damselflies). Protection of these lakes and ponds to "favor natural ecosystems", as defined in the current Forest Plan, addresses directly the need these species have for pre-adult life stages. Seemingly, (using the information available) protection of lake and pond habitat quality will keep odonate and aquatic plant populations in the respective lakes and ponds viable.

We acknowledge that given the extent to which the distribution of this habitat is controlled by physiographic and geologic characteristics that are uncommon on the Forest, we cannot influence these factors in any meaningful way through our actions. For those species that are tightly linked to these characteristics, they are likely to remain of viability concern for the foreseeable future, even if all other limiting factors we can control are improved. Consequently, those factors within our control are generally protective, with the opportunity for reintroduction of species, or reduction of disturbance regimes (e.g. beaver occupation) in isolated circumstances where research has indicated efficacy of these techniques in these habitats.

As a result of Forest Plan implementation since 1987, these habitats have been protected, and monitored periodically. Forest Plan and Forest actions that have provided for ecological conditions needed to maintain these species or improve their viability, considering the natural distribution and abundance of both the species and associated conditions, include:

- Working cooperatively with users and resource specialists to limit access-caused water quality problems at Wallingford Pond.
- Annual monitoring of ponds that are known or suspected to have breeding populations of loons (no closures have been identified as needed to date).
- Conducted a flight over the Forest for baseline monitoring of beaver populations and distribution of activity.
- Conducted, in cooperation with Jerry Jenkins, a survey of the ecology of high elevation ponds on the GMNF.
- Conducted, in cooperation with the VNNHP, a rare aquatic plant survey of all known ponds within the GMNF.
- Conducted, in cooperation with Vermont Department of Fish and Wildlife, and Rutgers University, a survey of the odonates of the GMNF.

The risk associated with continued implementation of the Forest Plan as written appears low for species of these pond habitats. Standards and guidelines that exist in the Forest Plan have been used to protect potential habitat where such habitat could not be surveyed; where surveys have been conducted and sensitive species found, site-specific plans have been developed to eliminate or mitigate conflicts. Limits to use or access to some of these ponds to protect water quality (and thereby rare species) has proven to be a difficult issue, and we continue to work with users to find solutions that enable recreation pursuits that are sensitive to these rare inhabitants of the ponds. Where dispersed camping is allowed at a pond site (e.g. Wallingford, Grout Ponds), efforts to move campsites and pit toilets away from the pond edge to protect water quality continue. It does not appear that GMNF actions are currently contributing to any loss of persistence of species of these habitats.

Cumulative Effects

We don't anticipate any additional cumulative effects on this group, beyond those discussed above for the entire RFSS group.

River and Stream Dwellers

Affected Environment

This habitat includes large, small, and intermittent streams and rivers, as well as riparian zones associated with such streams. Such habitats are distributed abundantly and widely across the Forest. Often, the streams of interest have certain unique characteristics that make them suitable habitat (e.g. limy or circumneutral pH), but for the most part it's not well known precisely what stream character(s) is desirable for the rare species of this habitat. Although riparian zones often include wetlands in areas of beaver influence, those wetlands and their associated species are considered under the wetlands species group, listed below. Forty-nine streams and stream segments are recognized in the Forest Plan in a protective Management Area (MA 9.4), and management guidance for these streams applies to a corridor ¼ mile from either bank, which would include most of the riparian zone associated with each stream. All of these streams with corridors are mapped within GIS.

Species known to occur in association with this habitat are listed here (specific habitat requirements are detailed in Table 2):

Wood turtle
Brook floater
Creek heelsplitter
Superb jewelwing
Cobblestone tiger beetle
Harpoon clubtail
Mustached clubtail
Southern pygmy clubtail
Maine snaketail
Forcipate emerald
Ocellated emerald
Rough avens
Butternut
Auricled twayblade
Jacob's ladder

The factors that tend to influence the integrity of these habitats and the rare species occurrences within them are varied. There are obvious structural limits to these habitats (they are restricted to stream channels that have developed in place over thousands of years), and factors such as climate change and acidic deposition still affect these waterways. Climate change can affect water temperature, which at certain thresholds changes the community structure and will therefore limit some species. Changes in water chemistry due to acid deposition can also introduce similar changes. Beaver, as discussed above for pond dwellers, have similar impacts in riparian corridors, flooding the riparian zone in portions of streams that they have impounded. Species that make use of the riparian corridor (particularly plants) will often be eliminated due to this flooding, but also are likely to be adapted to beaver cycles and so can exploit riparian habitat that has reopened when a beaver dam has been abandoned. In addition to beaver, humans have had a long and storied history of use of these waterways; the imprint of that use can still be found in many streams, and that imprint is as much a part of the stream as the geological material over which it runs. We cannot remove the imprint, although we can attempt to recreate a more desirable stream system.

Because many of our streams have varied ownership, with some of the larger streams having only small segments managed by GMNF, private management activities such as agricultural use, development, and vegetation management can all contribute problems to water quality in adjacent portions of the streams on National Forest. These activities are not directly within our control, but we can influence them through cooperative partnerships with adjacent landowners.

Limiting factors well within GMNF control, as discussed with pond dwellers, are associated with changes to water quality, including sedimentation, water temperature, as well as invasive exotics and pollutants. These factors can be made limiting through poorly designed and implemented timber harvesting, road building and stream restoration projects, as well as recreational use (foot traffic as well as motorized traffic), especially within the riparian zone and at stream crossings. These activities can increase sediment flow into the streams or change the nature of the substrate, affecting habitat for aquatic species that depend on certain substrate material; these activities also have the potential to change the light regime along the shoreline by removing canopy trees that provide shade, regulate temperature, and contribute woody debris. In addition these activities have the potential to introduce pollutants and invasive species into these stream systems, further reducing the integrity of the habitat.

Direct and Indirect Effects

Water quality protection for potential Wild, Scenic or Recreational Rivers was developed and formally incorporated into the GMNF's Forest Plan on 7/25/88; the list of the waterways involved is found in appendix J; Standards and Guidelines can be found in Forest Plan pages 4.180-1 through 4.180-20. In March of 1989, the Forest Plan was amended to incorporate goals for the Rise to the Future (fisheries) initiative. Forest Plan pages 4.73-1 and 4.732-2 give guidance for timbering activities in stream riparian zones, as does pages 4.37-1and 4.37-2 for management specific for fisheries goals. The current Forest Plan also reflects the recognition that general water quality is to be protected through riparian standards and guidelines on the GMNF (1987, 4.19-4.20). All of these S&Gs seek to protect water quality and stream conditions; and in doing so, will protect RFSS species currently utilizing those "riverine" communities.

Timber sale monitoring for implementation of soil and water standards and guidelines indicates that these standards and guidelines are implemented most of the time, and when implemented they are almost 100% effective in protecting soil and water resources (USDA 2000c). Such results indicate that the existing standards and guidelines for protection of water quality likely protect many of the water quality needs of these species.

Fourteen of the fifteen "river and stream" dwelling sensitive species are new additions to the GMNF's list (jacob's ladder being the exception). Of these fourteen, ten (all animals) can be expected to spend nearly all of their lives in, or directly next to their river/stream of origin. The four sensitive plants (including jacob's ladder) are found in riparian zones on the Forest, either adjacent to or near the stream. The wood turtle is the only species that is likely to travel from riverine riparian areas – as an adult. Typically, the wood turtle lays its eggs, and hibernates in riparian areas, or the river/stream "proper". Current Forest Plan direction will protect the stream and riparian habitats for the fourteen species that spend their lives in that habitat. We anticipate that individual, adult, wood turtles could be adversely impacted by other activities, away from riparian areas; this impact is not likely to lead to loss of viability, or threat of federal listing, of wood turtles on the GMNF.

We acknowledge that given the extent to which the quality of this habitat is controlled by such factors as physiography, climate change, and atmospheric deposition, we cannot influence these factors in any meaningful way through our actions. For those species that are tightly linked to these characteristics, they are likely to remain of viability concern for the foreseeable future, even if all other limiting factors we can control are improved. Consequently, those factors within our control are generally protective, with the opportunity for reintroduction of species, or habitat restoration in isolated circumstances where research has indicated efficacy of these techniques in these habitats.

As a result of Forest Plan implementation since 1987, these habitats have been protected, and monitored periodically. Forest Plan and Forest actions that have provided for ecological conditions needed to maintain these species or improve their viability, considering the natural distribution and abundance of both the species and associated conditions, include:

- Formation of the White River Partnership which seeks to restore and improve stream and riparian habitat along the White River, in cooperation with adjacent landowners and other partner organizations.
- Implementation of anadromous (Atlantic salmon) and inland (brook trout) fish habitat restoration projects over the last 10 years, which includes introduction of woody debris and improvement of stream substrates that will also benefit some sensitive species.
- A survey in 1994 by Frank Carle, Rutgers University, for odonates of the GMNF that included this habitat.

The risk associated with continued implementation of the Forest Plan as written appears low for species of these stream habitats. Standards and guidelines that exist in the Forest Plan have been used to protect potential habitat where such habitat could not be surveyed; where surveys have been conducted and sensitive species found, site-specific plans have been developed to eliminate or mitigate conflicts.

The problem of introduction of invasive species, specifically Japanese knotweed (Polygonum cuspidatum), continues to be a problem along the larger rivers, and threatens to severely reduce the diversity of riparian habitat and negatively impact reproduction of butternut in the riparian zone. The Forest Plan does not specifically address this invasive species. However, there is currently little research indicating what actions are effective at eliminating the species or preventing its spread. The Forest Plan does address Integrated Pest Management, which includes plants, on pages 4.88-4.90. In FY 2001 we plan to investigate techniques for control as part of a fish habitat improvement project. These results may help us determine what changes to the Forest Plan are needed to guide management to limit the spread of this species. In sum, then, it does not appear that GMNF actions are currently contributing to any loss of persistence of sensitive species of these habitats.

Cumulative Effects

We don't anticipate any additional cumulative effects on this group, beyond those discussed above for the entire RFSS group.

Ephemeral Pool Dwellers

Affected Environment

The habitat for this group is associated with vernal pools, which are small, ephemeral waterbodies that hold water in early spring, retaining the water through early summer into July, after which they dry up. These pools provide habitat for many woodland amphibians that live a portion of their lives in water. Such pools are not suitable for fish or other potential aquatic predators, but are for some small invertebrates upon which the young amphibians prey. Vernal pools that have been noted by field workers and partners are noted on project or compartment maps. There has not been an exhaustive survey for vernal pools, although the VNNHP Significant Features inventory included areas deemed potential pool sites, some of which were surveyed, but with little success.

Species known to occur in association with this habitat are listed here (specific habitat requirements are detailed in Table 2):

Jefferson salamander – *Ambystoma jeffersonianum*

Factors that tend to limit species of this habitat include physiography, elevation, atmospheric deposition, beaver activity, and water quality. These pools tend to be very small patches, widely spread across the landscape, reflecting the physiography of the landscape. Physiography, including topography and soil types, tends to govern where vernal pools can develop – in small concavities on slope benches or low gradient slopes, or in hilly or gentle terrain. Soils tend to be underlain with a hardpan or bedrock that restricts water movement through the soil. The size and patchiness of these pools tends to limit the distribution of species associated with them, and so each pool becomes critical for breeding success and population persistence. For Jefferson's salamander, the pools also have to be located at low elevations (below 1200'), which is an elevation zone itself uncommon on the Forest. Atmospheric deposition, including both acid and heavy metal deposition (e.g. mercury), can limit the water quality of these pools for salamanders. The permeability of the skin of these animals, coupled with increased concentration of these pollutants due to the small volumes of water in these pools, can lead to negative consequences such as deformities and breeding failure. Additional information regarding amphibians and habitat suitability on the GMNF can be found in Andrews (1995a; 1995b).

Beaver activity also has the potential to alternately create and destroy vernal pools due to their ability to reconfigure the landscape in and around their impoundments followed by abandonment. As noted earlier for other groups, our working assumption is that all of the organisms associated with habitats that are impacted by beaver are probably adapted to beaver cycles. Given the expansion of the beaver population, however, and the lack of trapping pressure (or other forms of predation), there is the possibility that beaver impacts could affect distribution, quantity and quality of vernal pools.

As for the other water-associated species, factors well within GMNF control include any ground disturbing activities that could remove trees or construct travelways in and around vernal pools. Removing trees will affect water temperature of the pools unfavorably. Traveling through the pools during the breeding season will kill individuals, and traveling through them at other times has the potential to destroy the characteristics that help the pools retain water into the summer (although in some cases driving through pools when unoccupied also has the potential to deepen and improve pool quality).

Direct and Indirect Effects

One of the newly identified GMNF RFSS animals depends on the occurrence of vernal (ephemeral) pools for their continued existence – the Jefferson salamander. While our Forest Plan never mentions vernal pools, direction for the protection of and buffers around bodies of water (a vernal pool would "qualify") can be found on Forest Plan pages 4.19 and 4.20 – this direction includes the management of protective shading. Habitat provision for woodland amphibians can be found on Forest Plan page 4.33; specifically, the retention of dead and down woody material.

Forest Plan implementation effects to the Jefferson salamander are quite similar to those for the wood turtle. The Forest Plan gives adequate protection for the habitat component (vernal pool) that is required for breeding and early larval stages. Once individuals mature and migrate away from their natal pools they become susceptible to direct negative impacts associated with other activities prescribed by our Forest Plan (e.g., skidding, motorized recreation). As with the wood turtle, these negative effects to individual Jefferson salamanders are not likely to lead to loss of viability, or threat of federal listing, of the species on the GMNF.

We acknowledge that given the extent to which the distribution of this habitat is controlled by a combination of factors, such as physiography and elevation, which are uncommon on the Forest; and quality is controlled by such factors as atmospheric deposition, we cannot influence these factors in any meaningful way through our actions. For those species that are tightly linked to these characteristics, they are likely to remain of viability concern for the foreseeable future, even if all other limiting factors we can control are improved. Consequently, those factors within our control are generally protective, with the opportunity for reintroduction of species, or habitat restoration in isolated circumstances where research has indicated efficacy of these techniques in these habitats.

As a result of Forest Plan implementation since 1987, these habitats have been generally protected when encountered. Forest Plan and Forest actions that have provided for ecological conditions needed to maintain these species or improve their viability, considering the natural distribution and abundance of both the species and associated conditions, include:

- Active avoidance of vernal pools during timber harvesting activities.

The risk associated with continued implementation of the Forest Plan as written appears low for species of these pool habitats. Standards and guidelines that exist in the Forest Plan have been used to protect potential habitat where such habitat could not be surveyed; where surveys have been conducted and pool habitat found, site-specific plans have been developed to eliminate or mitigate conflicts. In sum, then, it does not appear that GMNF actions are currently contributing to any loss of persistence of sensitive species of these habitats.

Cumulative Effects

We don't anticipate any additional cumulative effects on this group, beyond those discussed above for the entire RFSS group.

Species of Wetland Habitats

Affected Environment

This habitat includes all manner of wetlands, from large extensive beaver meadow complexes, to shrub swamps, to peatlands, to spring seeps, to wet upland meadows and roadside ditches. It includes any forested land that tends to be wet most of the year, and that often doesn't completely freeze up in the winter. It includes both limy and acidic wetland conditions. While it does not specifically include ponds that are embedded within wetland complexes, these wetland areas often provide for habitat needs of some pond and stream species as well (those that are not true aquatic species). Consequently, species associated with this habitat that are repeated in previous groups are those that do not show distinct preferences for aquatic habitat or strong associations with ponds or streams. This habitat type is identified on the Forest in several ways – on National Wetlands Inventory maps of the Forest, on ELT maps (certain ELTs are associated with wet soil conditions), on Compartment maps based on field surveys, and on VNNHP Significant Features maps based on field surveys by VNNHP. A survey of wetland habitats on the Forest based on Compartment data indicated approximately 650 open wetlands in the southern half of the Forest, and approximately 200 wetlands on the northern half (Williams 1996). Many of these wetlands are associated with rivers, but are not considered under the stream dwellers habitat type because they are functionally wetlands.

Species known to occur in association with this habitat are listed here (specific habitat requirements are detailed in Table 2):

Hairy woodmint
Water sedge
Prickly bog sedge
Schweinitz's sedge
Small yellow ladyslipper
Showy ladyslipper
Rough avens
Fall dropseed muhly
Eastern jacob's ladder
Green pyrola
Wild red currant
Narrow blue-eyed grass
Eastern blue-eyed grass

Factors affecting wetlands are many, and are similar to those discussed for all of the previous groups associated with water, including changes in climate, elevation, physiography, atmospheric deposition, previous land use, beaver use, and water quality. The limits that the first five factors noted here impose are no different than those discussed earlier for other groups, and are not detailed here. Beaver is most likely the principle driver in physical and vegetation changes to the ecology of a particular wetland. The wetlands study by Williams (1996) indicated that the majority of wetlands on the Forest are riverine, and that all riverine wetlands sampled were influenced by beaver, with 65% of the wetlands sampled indicating fairly recent development. Jenkins (1981) suggests that many rare plants associated with wetlands require wetlands that are stable and have developed over long periods of time. Peatlands, which have developed over hundreds of years, are very rare on the Forest (Compartment data indicate less than 30 peatlands on the Forest, and Williams' sample of 4 of these peatlands (1996) indicated that 50% were not actually true peatlands). Consequently, it is likely that given all of the wetlands on the Forest, only a tiny percent provides suitable habitat for sensitive species.

However, historical and current land management patterns are providing atypical wetland habitats that some sensitive species are exploiting – namely wet roadside ditches and upland meadows made wet either through soil compaction on an existing shallow hardpan soil (this can include old log landings and old woods roads that are still somewhat open). Species like Eastern jacob's ladder and the two blue-eyed grasses are known currently from such sites. It is not clear what particular characteristic the species using these habitats are keying in on, and it's not clear why some have not been located in more typical wetland environments. Given these questions, it is not clear what management strategies can be undertaken to improve conditions, other than simple protection and monitoring to improve understanding.

Water quality, as in other groups, is one area that GMNF actions can directly influence; another is hydrology. As noted earlier, activities permitted under the Forest Plan, such as timber harvesting, and road/trail construction and use, can potentially have negative effects on water and wetland habitat quality, including sedimentation, changes in light and temperature regime, pollution, and introduction of exotic invasive plants. In many cases, existing trails and roads pass through wetland communities. This can also affect hydrology, as water flow in these wetlands is near enough to the surface to be impacted by the presence of such barriers. As just noted, however, certain roads in certain places do have the potential to create apparently suitable "wetland" habitat.

Direct and Indirect Effects

Forest Plan guidance for wetland management can be found on page 4.34, stating that wetlands will be managed "...to favor natural ecosystems and indigenous species." In addition, soil and water standards and guidelines (USDA 1987, 4.22-4.25) provide some protection for wetlands, including limits on logging in these areas to frozen ground conditions only; however, harvesting is still allowed in forested stands that are wet. Site-specific protection measures for well-known significant wetlands are found on page 4.159 for Lost Pond Bog, on page 4.168 for Beaver Meadows, and on page 4.172 for Blue Ridge Mountain Cranberry Bog (which is actually a fen).

We acknowledge that given the extent to which the quality of this habitat is controlled by such factors as physiography, climate change, and atmospheric deposition, we cannot influence these factors in any meaningful way through our actions. For those species that are tightly linked to these characteristics, they are likely to remain of viability concern for the foreseeable future, even if all other limiting factors we can control are improved. Consequently, those factors within our control are generally protective, with the opportunity for reintroduction of species, or habitat restoration in isolated circumstances where research has indicated efficacy of these techniques in these habitats.

As a result of Forest Plan implementation since 1987, these habitats have been protected, and monitored periodically. Forest Plan and Forest actions that have provided for ecological conditions needed to maintain these species or improve their viability, considering the natural distribution and abundance of both the species and associated conditions, include:

- Conducted, in cooperation with the University of Vermont, a wetlands classification and assessment project in 1995-1996 to evaluate the ecology of wetlands typical of the Forest, and to explore the relationship of these wetlands historically and pre-historically with beaver.
- Monitored Blue Ridge Bog and evaluated it for Research Natural Area candidacy (it was initially recommended and will likely move through the formal designation process during Forest Plan revision).
- Participated in the formation and implementation of a "Keeping Tracks" group that monitors the Abbey Pond and Beaver Meadows area several times each year, observing and recording animal species noted (usually through their tracks) along fixed transects.
- Non-forested wetlands discovered during project review are routinely avoided and buffered during project layout, and many forested wet stands are also avoided due to the difficulty these areas have in maintaining frozen ground conditions, as required, during winter harvesting.
- Periodic monitoring of beaver activity as part of the MIS program.

The risk associated with continued implementation of the Forest Plan as written appears low for species of these wetland habitats. Standards and guidelines that exist in the Forest Plan have been used to protect potential habitat where such habitat could not be surveyed; where surveys have been conducted and sensitive species found, site-specific plans have been developed to eliminate or mitigate conflicts. Although wet forested stands as a group are still considered operable in the winter, warmer winters and difficulty in freezing up those areas with shallow, seepy, hardpan soils have led to more of these areas being excluded from harvesting, and more monitoring of these areas during harvesting. Unfortunately we have examples where unexpected thaws in such harvest areas have led to damage to suitable habitat (although no loss of sensitive species populations). Such examples are what have led to increased sensitivity towards these areas among forest managers, and a general decrease in the number of such stands identified for commercial harvesting. In addition to harvesting, trail impacts to wetlands still occur, especially during reconstruction of existing trails that were originally placed through or adjacent to wetlands. During project proposal, trail managers, field implementers, and forest biologists work closely to develop mitigation that does not increase wetland impact, and often improves wetland function through improved water movement or reduced sediment flow. In sum, then, it does not appear that GMNF actions are currently contributing to any loss of persistence of sensitive species of these habitats.

Cumulative Effects
We don't anticipate any additional cumulative effects on this group, beyond those discussed above for the entire RFSS group.

Species of Enriched Northern Hardwoods

Affected Environment
Enriched northern hardwood forest habitat is represented by northern hardwood forest with a preponderance of sugar maple, white ash, and occasional basswood. The flora is striking in terms of abundance and diversity, with a distinct spring ephemeral flora. Vermont ecologists have come to conceive of these places as some of the highest diversity forests in Vermont. This community generally takes the form of large and small patches, with the smallest and most discrete patches occurring in the Green Mountains at moderate elevations, and the largest patches occurring in the Taconic Mountains, where the community tends to reach its most characteristic development. Often, the community is associated with calcareous substrates, including limestone, marble, dolomite, calcareous schist, and calcareous till. This community can also form in places in the landscape that are moist and tend to pool organic matter (referred to as a composting effect). Landforms such as toe slopes, coves, and colluvial slopes can tend to show these characteristics in places that are mesic and are at elevations dominated by northern hardwoods. In general, however, the form of this community that is most associated with sensitive species tends to be that which occurs with calcareous substrates. Unfortunately, our ability to predict the occurrence of this substrate has proven poor over the past 8 years; we have found far more occurrences of this habitat than would be predicted by any existing data or maps. Bedrock maps do not show the great number of small bands and veins of calcareous bedrock found in the mountains; soil maps do not recognize a limy soil type in the mountains, although such types exist on the ground; and till chemistry is currently not mapped for Vermont, although we have found calcareous till in the mountains. Consequently, we identify the potential habitat for this community currently through a combination of ELTs and stands with records of basswood, butternut, or white ash. In areas that have inadequate or suspicious data, we will generally field survey specifically for this type. In general, the rate of success of finding these sites through field survey is as good as the predictive ability of our existing data, about 5-10%. Sites of this habitat currently recognized in the Forest Plan include The Cape Research Natural Area, which is a site for one of the 12 RFSS associated with the habitat.

Species known to occur in association with this habitat are listed here (specific habitat requirements are detailed in Table 2):

Hairy woodmint
Summer sedge
Canadian horsebalm
Large yellow ladyslipper
Male fern
Sweet joe-pye-weed weed
Butternut
Ginseng
Broad beech fern
Round-leaved orchis
Green pyrola

Several factors associated with this habitat have the potential to limit the occurrence and distribution of sensitive species. First are the obvious factors noted above related to landforms and nutrient and moisture status. There are clearly positions in the landscape that are most conducive to the formation of these natural communities, and given the coincidence of landscape, calcium, and moisture, these forests can reach their greatest potential in terms of biodiversity and biomass. In the Adirondacks, it has been suggested, based on preliminary research, that acidic deposition over the long-term can deplete calcium stores in the soil to the point that nutrient status declines and forest composition changes (Jenkins, pers. com. 1999). The change in composition is indicated by lack of sugar maple reproduction and increases in beech. Such changes have not been seen in Vermont forests, suggesting that perhaps the soils of Vermont's hardwood forests are more buffered than those in the Adirondacks. However, continued loss of calcium certainly has the potential to reduce the acreage of suitable habitat over the long-term.

Aside from obvious physical constraints to the distribution of these forests, land use history has been indicated as having a role in affecting biodiversity in these forests (Thompson and Sorenson 2000). Agricultural lands in these landscape positions or in areas of limestone, which have been abandoned and allowed to return to forest, show a reduced flora, compared to forests of similar age that have had no agricultural history. Lands that have been plowed show the greatest reduction.

Factors that the GMNF can affect are those related to direct impacts from resource management and use, as well as changes in short-term nutrient status, composition changes, invasion by exotic species, and collection of sensitive species in these habitats. Several RFSS occur adjacent to trail corridors, and so changes in the recreational use of a trail (e.g. conversion from hiking only to hiking and ATV use), as well as trail maintenance and reconstruction, can directly impact these species leading to loss of populations. There has been no demonstrated long-term effect of selective logging on the suitability of these habitats, other than site-specific impacts to individual plant populations. These forests are considered resilient, and are reputed to rebound quickly after disturbance. However, long-term development of the pool of rich organic matter contributes to development of this community, and so activity that can reduce soil productivity or increase depletion of this pool of organic matter may limit the suitability of this habitat. Obviously, conversion of rich northern hardwood stands to other forest or non-forested types (e.g. increasing red spruce or conversion to an opening or aspen) will eliminate suitable habitat for a while. Areas of high biodiversity due to high nutrient availability have been shown to be vulnerable to invasion by exotic species. Activities that introduce such invasive species into these forests have the potential to affect the viability of sensitive species in these habitats. Such activities include construction of new travel corridors into rich woods from areas of exotic species; and introduction of new, wheeled vehicle or horse use into rich woods. Potential species-specific effects include collection of ginseng and orchids to their exclusion from sites; damage to plants of rich seeps embedded in rich woods through logging on unfrozen ground; and forest succession to old growth near butternut, without canopy gaps needed for reproduction of this shade intolerant species. Butternut may have always been rare in these habitats (it is more frequent in riparian zones), and may have increased its occurrences in these areas historically through land use history (either planting or colonization of deforested suitable sites or abandoned homesteads).

Direct and Indirect Effects

The Forest Plan currently does not address this habitat specifically. Management guidance for The Cape RNA can be found on pages 4.163 through 4.163-4. Standards and guidelines for wetlands and riparian buffers can apply to wet ground within rich woods. Currently, the best way to describe the way the Forest Plan protects this habitat is to suggest that the variety of MA designations each include some representation of this habitat type. For instance, we know of areas of this habitat within Breadloaf and Big Branch Wildernesses (MA 5.1), The Cape RNA (MA 8.1), among other MA designations. Consequently, insofar as the Forest Plan seeks to balance the needs of all organisms that occupy the Forest, this distribution of different management philosophies across the range of this habitat may ensure that the needs of all of the associated species, including RFSS, are met. Currently, we have not studied this natural community in any great detail beyond attempting to predict its occurrence and trying to differentiate variants. However, much anecdotal data have been gathered by a variety of ecologists in Vermont interested in this natural community. Based on the best available information, we currently do not have any indication that adding new standards and guidelines for this natural community will serve to protect sensitive species of this habitat any better than the current approach. Monitoring data of uncommon and rare plants of this habitat where thinning and regeneration harvests have taken place do not indicate a loss of these species or a decline in the populations. Longer-term monitoring data is needed for a more definitive conclusion.

We do see this habitat frequently enough on the Forest that we have encountered conflicts between sensitive species occurrences and proposed activities. These conflicts are resolved using the existing standards and guidelines for rare plant communities (USDA 1987, 4.37). This is the one natural community of all those discussed in this BE where we are most likely to mitigate effects rather than avoid. This natural community not only provides suitable habitat for rare species, it is highly productive forest, and is known for its resilience and resistance to disturbance. Consequently, in areas of rare plant communities where management for high quality sawtimber is one of the primary goals, our mitigation measures have focused on frozen ground logging, avoiding skidding over known sites, and follow-up monitoring. This approach on three projects has had mixed results: in two cases there did not appear to be any negative impacts to the species of concern; in one case there were negative impacts to the habitat, although long-term impacts to species persistence needs further monitoring. In the latter case, the species of concern are not currently nor formerly RFSS or Forest Species of Concern; rather the concern was the integrity of the habitat and its potential suitability for RFSS. It is clear that any undesirable impacts were most related to communication of the desired mitigation to the field operators, rather than the lack of a site plan. Where the loggers and sale administrators are sensitive to the values associated with these sites, and the mitigation measures and needs are clearly communicated from the planners and biologists through to the loggers, mitigation appears to work. Consequently, these results have been used to improve communication between sale planners, sale administrators, foresters and biologists.

Because several of the RFSS associated with this habitat are known from trail corridors, conflicts in the recreation arena have also arisen. In these cases, we operate from the presumption that RFSS associated with trail edges are able to withstand historical levels of use. Consequently, changes in use, or new disturbances, are of greatest concern. Most projects involving new disturbance near RFSS have been monitored at least once since implementation, and we have found no detectable impacts to RFSS as a result. Known rare species occurrences along the Appalachian Trail corridor are monitored periodically, by volunteers, on a schedule developed in cooperation with the VNNHP and ATC.

The Forest Plan does not address ginseng or orchid harvesting. However, addition of ginseng and the other sensitive orchids to the RFSS list has essentially made them off limits to any harvesting, either commercial or personal (FSM 2673.2). Currently we have no assessment indicating the level of unauthorized harvesting of ginseng or other sensitive plants on the Forest.

We acknowledge that given the extent to which the quality of this habitat is controlled by such factors as landforms, geology, and perhaps atmospheric deposition, the GMNF cannot influence these factors in any meaningful way through our actions. For those species that are tightly linked to these characteristics, they are likely to remain of viability concern for the foreseeable future, even if all other limiting factors we can control are improved. Consequently, those factors within our control are generally protective, with the opportunity for reintroduction of species or habitat restoration in isolated circumstances where research has indicated efficacy of these techniques in these habitats.

As a result of Forest Plan implementation since 1987, occurrences of these habitats and species have been mapped, protected, and monitored. Forest Plan and Forest actions that have provided for ecological conditions needed to maintain these species or improve their viability, considering the natural distribution and abundance of both the species and associated conditions, include:

- Evaluation and designation of The Cape Special Area as a Research Natural Area in 1993. We then established a monitoring grid with the assistance of Sterling College and NEFES and have formally monitored the site to gather baseline floristic data. A site land use history was also developed.
- An inventory of all ice damaged lands on the Rochester District turned up many new rich woods sites that have been mapped and digitized in our GIS, enabling new modeling of distribution of rich woods on the Forest.

- Work of the White Mountain National Forest and the NEFES in Durham has led to the development of a till chemistry and distribution model; this has led to sampling on the GMNF and possible application of the model to the GMNF within the next 2 years.
- Participation in various statewide workshops and discussion groups on the ecology of rich woods.
- Additional plot sampling in rich woods to gather local data on ecology, particularly in stands undergoing regeneration harvest.
- Periodic monitoring of significant features, including RFSS in this habitat, within the Appalachian Trail corridor by a cadre of volunteers organized by the ATC.

The risk associated with continued implementation of the Forest Plan as written appears low for species of these enriched northern hardwood forest habitats. Standards and guidelines that exist in the Forest Plan have been used to protect known sites; any project areas remotely suggestive of rich woods are surveyed for habitat and rare species; where surveys have been conducted and sensitive species found, site-specific plans have been developed to eliminate or mitigate conflicts. Conflicts have been resolved within the context of the current Forest Plan, and where impacts have occurred, they have been the result of administrative or communication errors rather than issues over the language in the Forest Plan. Such errors have resulted in improved communications and sensitivity to RFSS issues. In sum, then, it does not appear that GMNF actions are currently contributing to any loss of persistence of sensitive species of these habitats.

Cumulative Effects

We don't anticipate any additional cumulative effects on this group, beyond those discussed above for the entire RFSS group.

Species of Dry, Low Elevation Woods

Affected Environment

This habitat is a combination of several recognized natural communities, all of which have several things in common, and together comprise The Nature Conservancy's "Oak-Northern Hardwood Forest Formation". This group represents a transition from northern hardwoods to central hardwoods. They occur at low elevations in warm areas, they are dry sites, they tend to be dominated by oaks, pines, and other hardwoods associated with drier sites, and they are most common in the western and eastern sides of Vermont – not the mountains. Most of this habitat on the Forest is associated with the western edge of the Forest along the Champlain and Vermont Valleys (known as the western escarpment), the lower elevations of the Taconics, and warmer stream valleys that extend into the mountains from the west. Variations of this habitat included here are both forest and woodland types, and both acidic and calcareous substrates. However, mesic types that are part of this forest formation are not included here, but are included in enriched northern hardwoods if they have rich characteristics. This habitat often grades from forest to woodland to open rocks and ledges; however for this habitat type the more open rocky environment is not considered here but earlier in the rocky habitat group. Species duplicated here and under the rocky habitat group are those that do not show distinct affinities towards open rock, but may occur as well in shallow rocky soil within a woodland environment. Deep but sandy soils that are extremely well drained also contribute to this habitat characterization. Consequently, opening edges that occur within this zone are also considered part of this group. This habitat is recognized in the Forest Plan at Rattlesnake Point and Falls of Lana (forested and woodland portions).

Species known to occur in association with this habitat are listed here (specific habitat requirements are detailed in Table 2):

Fernleaf yellow false-foxglove
Bronze sedge
Squaw-root
Paniculate tick-trefoil
Large whorled pogonia

Hairy bush-clover
Round-leaved orchis
Three-leaved rattlesnake-root
Green pyrola
Stout goldenrod
Perfoliate bellwort

Factors that limit species associated with this habitat tend to be primarily associated with the physical constraints of the landscapes they occur in. These factors are associated with soil moisture, depth of soil, and mineralogy of the substrate. Species of these dry sites do not compete well with other species of northern hardwood forests when moisture is abundant in the soils. Consequently, physical factors that keep these soils dry (e.g. bedrock near the surface or deep sandy soils) will tend to maintain habitat suitability. Climate is also a factor – most of these species are found at low elevations where climate is warmer. Presence of either calcareous or acidic conditions is important, as some species are more tolerant of acidity than others in this group.

In addition to physical factors, land use history and/or prehistoric disturbance regimes may also be factors in maintaining suitability of habitat. While the GMNF cannot change the imprint of these historic legacies, it can theoretically influence perpetuation of this habitat through reintroduction of these historic regimes. It is suspected that the woodland character of several of these sites was either created through sheep farming in the late 19th century, or through fire occurrence. There is documentation of fire along the western escarpment ecosystems, but only one site has a documented detailed fire history that includes both historic and prehistoric time periods (Mann et al. 1994). Visits to several of the woodland sites along the escarpment north of Brandon in 1999 found some occurrences of fire scars on trees and charcoal in the soil, as well as the presence of pitch pine, a tree well-known for its association with natural fire regimes. Some of these sites that are woodland now appear to be succeeding to forest, and for many of the species in this group that conversion will limit suitable habitat. It may be that without fire or some other form of disturbance that maintains the woodland character, the tendency towards succession to closed forest is strong in all but the most extreme site conditions in these areas.

Other factors that can limit species and are within the control of the GMNF to influence include direct impacts resulting from tree harvesting and skidding, and road and trail building. While in some circumstances the opening up of a closed forest to a more open canopy can benefit several species in this group, such actions may be detrimental to others. Obviously, any ground-disturbing activities in this habitat can directly impact particular populations. Because the woodland types within this habitat group can exhibit a fairly harsh environment for species, direct impacts to sensitive species may have a more dramatic negative effect on species persistence than in a more mesic environment. To the extent that trails break up the canopy of these dry forests and may create a woodland "micro-environment" along their edges, sensitive species along trails in this group of habitats may derive a benefit from these trails, although changes in trail use (more severe impacts or abandonment) can quickly erase that benefit.

Direct and Indirect Effects

The Forest Plan does not address this habitat directly, except in addressing Rattlesnake Point and the Falls of Lana (1987, 4.171), and in perpetuating red oak as a member of the oak-hickory type described in the Forest Plan as an "Uncommon Vegetative Type" (1987, 4.30). Standards and guidelines that can be applied to this habitat include those involving protection of shallow soil or steep areas (1987, 4.22), those involving maintenance of oak trees and forests for their wildlife value as mast trees (1987, 4.33), and those involving prescribed fire (1987, 4.86). Currently, the most applicable guidance in the Forest Plan for protection of sensitive species of this habitat involves the guidelines for Rattlesnake Point and the rare plant community guidelines (1987, 4.37).

Because the habitats in this group tend to not be productive, and are often too steep for logging, many vegetation management activities tend to be restricted from these areas. However, because this habitat group also includes forests of red oak, a high value species for timber, vegetation management does take place in the less steep portions of these areas. We have conducted plant surveys in timber sale areas proposed for harvesting within these habitats, and where sensitive plants have been found, mitigation measures have been employed to protect the plants. Since 1992, three timber sales have been implemented within this habitat, and of those, one had rare plants identified and mitigation measures employed for protection. Monitoring at this site after the sale suggested no reduction of species abundance or persistence, although long-term monitoring is needed for a more definitive conclusion.

While controversial, regeneration harvesting in red oak forests is currently the most reliable method sanctioned by the Forest Plan to perpetuate this natural community. It is well known that red oak is less tolerant of shade than its competitors in this area (beech and sugar maple); it is also clear that in places where forests of red oak are maturing, northern hardwoods are successfully competing with oak in the understory to become the next stand. Such a conversion to northern hardwoods may seem a "natural" trend in forest succession, but research in other oak systems clearly shows that natural and anthropogenic fire can contribute to perpetuation of oak within these forests, and such a disturbance regime is currently lacking on the GMNF, although it clearly had an historical and prehistorical presence in some areas. The succession of red oak forests to northern hardwood forests in areas where vegetation management is not allowed may ultimately limit the suitability of the western escarpment for some species.

Species adjacent to trails have been protected when trail maintenance or improvement projects have been proposed. This has occurred at least twice, and monitoring following project implementation indicates no loss of persistence for the species involved as a result of the trail work.

It appears, however, that there has been a decline of at least one species from the Rattlesnake Point site (Fernleaf yellow false-foxglove). Monitoring with VNNHP on 7/20/2000 indicated a decline from a patch approximately "...20' in diameter" (Thompson 1991a; Burbank 1993) to two individuals. The trail to the cliff overlook passes adjacent to the population. Current speculation regarding the cause of the decline includes natural population dynamics; impacts of trail use; tree canopy closure beyond some critical threshold; fire exclusion (suggested by research on this species in New Hampshire [Sperduto and Nichols 1999]); or impacts of last summer's drought. Currently the remaining individuals are competing with a vigorous stand of lichen. Interestingly, another RFSS known at the same site nearby (Three-leaved rattlesnake-root) was doing well and had increased population numbers since 1991. We will be working with the VNNHP to develop a strategy for the fernleaf yellow false-foxglove; however, it is clearly premature to recommend additional measures for inclusion into the Forest Plan for this species before having even a vague understanding of what limiting factor is operating in this decline. At this point, hiker overuse may be the least likely factor, as the Point has been closed to hikers during most of the summers of 1999 and 2000 due to peregrine falcon nesting.

We acknowledge that given the extent to which the quality of this habitat is controlled by such factors as physiography, climate, elevation, and geology, we cannot influence these factors in any meaningful way through our actions. For those species that are tightly linked to these characteristics, they are likely to remain of viability concern for the foreseeable future, even if all other limiting factors we can control are improved. Consequently, those factors within our control are generally protective, with the opportunity for reintroduction of species, or habitat restoration in isolated circumstances where research has indicated efficacy of these techniques in these habitats.

As a result of Forest Plan implementation since 1987, these habitats have been protected, and monitored periodically. Forest Plan and Forest actions that have provided for ecological conditions needed to maintain these species or improve their viability, considering the natural distribution and abundance of both the species and associated conditions, include:

- Initiating an assessment of the nature of fire as a natural disturbance regime in these escarpment ecosystems. The first step in the assessment was the development of an overview of fire history in Vermont and New Hampshire prepared by Bill Patterson of UMass. The GMNF has also started a local assessment of some of the escarpment sites on the Middlebury District where experimental prescribed fires could be tested for their ability to restore oak forest, woodland communities or rare plant communities.

- Development of an ecological classification system for the Taconics with the help of Bennington and Green Mountain Colleges, which will be used for mapping FS lands in 2001/2002. This will helps us identify areas of this habitat in the Taconics, with possible new rare plant occurrences.
- Implementation of regeneration harvests within oak stands. Such actions help to provide the sunlight needed by red oak to regenerate. Natural and supplemental red oak regeneration is then protected in tubes to prevent browsing by deer.

The risk associated with continued implementation of the Forest Plan as written appears low for species of these dry woods habitats. Standards and guidelines that exist in the Forest Plan have been used to protect potential habitat where such habitat could not be surveyed for projects; where surveys have been conducted and sensitive species found, site-specific plans have been developed to eliminate or mitigate conflicts. The Forest Plan also allows for use of fire to perpetuate desired vegetation, which is likely to receive additional attention over the next several years. For al species in this group except Fernleaf yellow false-foxglove, then, it does not appear that GMNF actions are currently contributing to any loss of persistence of sensitive species of these habitats. For the false-foxglove, it is not clear what actions, or lack thereof, could be contributing to the decline of this species. While it is conceivable that lack of management in terms of use of prescribed fire or canopy thinning could be contributing, this would not be for lack of direction in the Forest Plan, which allows and encourages the use of such tools for perpetuation of desired vegetation. Our monitoring of this population and active partnership with VNNHP and other Vermont botanists should in turn contribute to the reversal of this decline, if there are any actions that can be taken in that regard. Consequently, loss of viability on the GMNF of this species, if it were to occur, will unlikely be a result of implementation of the Forest Plan, but more the result of other factors beyond our control or understanding at this time.

Cumulative Effects
We don't anticipate any additional cumulative effects on this group, beyond those discussed above for the entire RFSS group.

Species of Subalpine Spruce-Fir Forests

Affected Environment
This habitat is associated with elevations generally above 2500', and extends to the krummholtz zone for our purposes here (krummholtz was considered part of the rocky habitat dwellers group in this BE). Because krummholtz itself grades into more typical spruce-fir forest at the higher elevation limits of this habitat, Bicknell's thrush, which is associated with krummholtz, is also included in this group. The lower elevation limit is generally defined as the point at which "...the woods are essentially indistinguishable from normal mountain woods" (Jenkins 1981). The lower elevation limit is usually not typified by a sharp type change, but rather grades into northern hardwoods over transition zones of narrow or wide width, and dependent upon physiography and sometimes substrate mineralogy. Forests of this group are predominantly red spruce and balsam fir, with some occurrences of high elevation hardwood forests of beech and yellow birch, and early successional forests of heart-leaved paper birch. While this habitat group is not recognized as an entity at any particular site on the Forest, it is a defining characteristic of most of the Long Trail, and is represented within four of the six designated Wilderness areas on the Forest as well as in White Rocks NRA. It is also a distinct feature of most of the downhill ski areas on the Forest.

Species known to occur in association with this habitat are listed here (specific habitat requirements are detailed in Table 2):

Bicknell's thrush
Round-leaved orchis
Green pyrola
Wild red currant
Northern mountain-ash

Factors that tend to limit species of this habitat are predominantly physical in nature. Climate, by way of elevation, is certainly a controlling factor, by maintaining a distinct spruce-fir zone in these mountains. Changes in climate may allow the edges of that zone to fluctuate, although the zone itself may not disappear. All four of these species tend to be associated, although not exclusively, with limy areas within this zone in the Green Mountains, and so while the spruce-fir forests of this zone are large matrix communities, the small patches of this type associated with the small veins of limy rock in the high elevations are likely quite uncommon. They are also, unfortunately, difficult to predict, as noted for rich northern hardwoods, due to the inadequacies of current maps in displaying limy rock or soils in the mountains. It is unclear what impact atmospheric deposition is having or could have on these species or the suitability of this habitat. Certainly the limy nature of the known sites for these species indicates that there is some buffering against increased acidity.

Factors that limit these species or habitats that are well within the abilities of the GMNF to influence include direct harm to species, loss of habitat (e.g. conversion of forest to ski slopes), and changes in light regime. On the GMNF, the activities that are most likely to affect these factors are ski area development activities (e.g. construction of new trails, widening of existing trails), and trail maintenance and construction activities. Both types of activities have the potential to directly impact individuals, change the habitat to an unsuitable condition for a long time, and introduce light, which may change the competitive dynamics in these areas.

Direct and Indirect Effects

There is currently no direction in the Forest Plan specific to this habitat group (for direction applicable to the krummholtz end of this habitat group, see the discussion for "High Elevation, Cliff, and/or Rock Outcrop Dwellers"). To the extent that this habitat is well defined geographically and is found in most MA designations, from the most protective (e.g. Wilderness), to the least (e.g. Highly Developed Areas), it faces the full range of management guidance the Forest Plan offers. Consequently, the most effective guidelines for protection of sensitive species in these habitats are simply the guidelines specific to rare plant communities (USDA 1987, 4.37).

Much of this habitat is considered unproductive or inaccessible forestland, and so is unlikely to be harvested even when allowed by MA designation. We have not run into harvesting conflicts between the Forest Plan and protection of this habitat group for sensitive species since the Forest Plan was approved. However, trail and ski area projects have raised conflicts with habitat and species protection. When such conflicts have arisen, species have been protected through development of site plans that minimize or eliminate impacts to those species. In all such cases, there is no indication that the management actions have contributed to any loss of species persistence or habitat degradation.

We acknowledge that given the extent to which the quality of this habitat is controlled by such factors as elevation, climate, and geology, we cannot influence these factors in any meaningful way through our actions. For those species that are tightly linked to these characteristics, they are likely to remain of viability concern for the foreseeable future, even if all other limiting factors we can control are improved. Consequently, those factors within our control are generally protective, with the opportunity for reintroduction of species, or habitat restoration in isolated circumstances where research has indicated efficacy of these techniques in these habitats.

As a result of Forest Plan implementation since 1987, these habitats have been protected, and monitored periodically. Forest Plan and Forest actions that have provided for ecological conditions needed to maintain these species or improve their viability, considering the natural distribution and abundance of both the species and associated conditions, include:

- Documentation of, through field surveys and mapping, several occurrences of calcareous bedrock at high elevations.
- Assessment, with Jerry Jenkins, of quality of subalpine habitat adjacent to the current Mount Horrid Special Area for possible inclusion as part of the recommendation of this area for Research Natural Area designation.

The risk associated with continued implementation of the Forest Plan as written appears low for species of these subalpine habitats. Standards and guidelines that exist in the Forest Plan have been used to protect potential habitat where such habitat could not be surveyed; where surveys have been conducted and sensitive species found, site-specific plans have been developed to eliminate or mitigate conflicts. In sum, then, it does not appear that GMNF actions are currently contributing to any loss of persistence of sensitive species of these habitats.

Cumulative Effects
We don't anticipate any additional cumulative effects on this group, beyond those discussed above for the entire RFSS group.

Forest Plan Sensitive Species Not Included as Current GMNF RFSS

Affected Environment
During the evaluation process for updating the RFSS list, three species that had in the Forest Plan been identified as sensitive for the GMNF were determined to no longer merit that designation for the GMNF (Table 3). These species originally recommended in the Forest Plan for inclusion on the RFSS list (Long-tailed shrew, New England cottontail, and Loggerhead shrike) were identified as having no evidence of their actual occurrence on the Forest. Monitoring and inventory activities by Forest biologists and cooperators have not found evidence for occurrences of these species on the Forest or in Vermont. With no known occurrences, it is currently unclear whether there is suitable habitat for the species in Vermont or the GMNF. Recently, Steve Parren of the VNNHP discussed the status of New England cottontail in a Burlington Free Press article (9/3/00), noting "Their status remains uncertain because there's a lack of evidence proving we have them here."

The current Forest Plan does not address reclassification of formerly sensitive species, nor species that are newly found on the Forest that have never been previously noted or evaluated and are likely to be of viability concern. Protected species standards and guidelines described in chapter 4 and appendix E are only invoked for species that are already designated as RFSS or Forest Species of Concern.

Direct and Indirect Effects
For the three species identified in the Forest Plan as "recommended sensitive" (Loggerhead shrike, Long-tailed shrew, New England cottontail), the current Forest Plan lists (1987, E.04, E.06-7) are in conflict with the Region's update of the RFSS.

Essentially, the Forest Plan is unclear on how new information regarding species that are or could be sensitive will be handled in terms of protections offered or withdrawn. Two interpretations can be conceived. Under the first interpretation, we would assume that the list in the plan, in combination with the updated RFSS, provides the list of species that will be protected, and so we would continue to protect the three species listed in the Forest Plan as sensitive, regardless of their lack of occurrences on the Forest, until an amendment changes their designation in the list in the Forest Plan. Consequently, they will be discussed in biological evaluations, to determine the effects of proposals on their viability or any trends towards federal listing. Given the lack of occurrences or known critical habitat, determinations will conclude that our actions are not contributing towards any viability concerns or trend towards federal listing. If they were discovered on the Forest, their existing Forest Plan status would give them immediate protection via the sensitive species standards and guidelines.

Under the second interpretation, we would assume that the updated RFSS list supercedes any list identifying sensitive species in the Forest Plan. This would be based on the manual direction and Forest Plan standards and guidelines relative to sensitive species that clearly indicate that designation and maintenance of the RFSS list is done by the Regional Forester (1987, 4.35). Consequently, these three species would no longer be discussed in BEs, as they are not known to, nor are they likely to, occur on the GMNF. Aside from the Forest Plan maintaining an inaccurate list of protected species (the effects of which were discussed previously for all sensitive species as a group), there do not appear to be any impacts to these species as a result, as they are not known to occur.

However, under either interpretation, if these three species were discovered on the Forest, the Forest Plan would not provide protection for them via the protected species standards and guidelines until they have been evaluated and designated as sensitive for the GMNF by the R9 Regional Forester. There is the slight chance that projects could impact new populations before designation in a protected category.

Overall, it is hard to imagine impacts to these species that would threaten their viability as a result of implementing the Forest Plan, due to the lack of known occurrences. There is a slight risk, due to lack of clarity in the Forest Plan, to these species if a population was discovered, prior to evaluation for possible RFSS designation. However, the chances of such a discovery are remote, speculative, and not really foreseeable, given the extremely low likelihood of these species occurring on the Forest at this time and under current conditions.

Cumulative Effects

We do not anticipate any cumulative effects on this group of species. These species join a growing list of species that have either never been known from the Forest, or have not been found on the Forest for decades. This list has grown for two reasons. First, many species thought to have habitat but not known on the Forest have been surveyed for and not found, and additional habitat research has suggested that the Forest has only marginal or unsuitable habitat. Second, research into old records has on occasion turned up new historical records for the Forest. The sites for such historical records, in some cases, have been surveyed without luck. In other cases the record is too vague to pinpoint a potential location (e.g. an entire town), and so suitability of the habitat is unclear. In either case, this list of species will provide volunteers and organizations with opportunities to rediscover species on the Forest, and so exclusion from the RFSS list does not detract from past, present, or future conservation efforts for these species.

Determinations for Sensitive Species

After reviewing the current GMNF Forest Plan, as amended, the literature and records, and consulting individuals, the following determinations regarding the effects of implementation of the Forest Plan on conservation and management of RFSS is made:

Species	Determination
All RFSS and former RFSS currently identified as not known or likely to occur on the GMNF	No impacts.
All RFSS currently identified as present but not sensitive on the GMNF	May impact individuals; not likely to lead to loss of viability or a trend towards federal listing.
All RFSS currently designated as sensitive for the GMNF	May impact individuals; not likely to lead to loss of viability or a trend towards federal listing.

Rationale:

Based on the analysis of effects contained in this BE, implementation of the Forest Plan has some potential, however minor, to impact individuals of any given RFSS currently designated as sensitive for the GMNF, although not leading to loss of viability or trend towards federal listing. It is the nature of the Forest Plan, and the agency's multiple use mission, to balance the benefits derived from the Forest; however, it is also agency policy to avoid or minimize impacts to RFSS, and where impacts cannot be avoided, they may be allowed so long as such impacts do not contribute to a loss of viability or result in the need for federal listing of species (FSM 2670.32). It is also the goal of the current Forest Plan, as amended, to "Protect all threatened, endangered and sensitive species, as well as other species of concern on the National Forest." (1987, 4.05). In practice, implementation of the Forest Plan has been consistent with that goal, as evidenced by the actions the Forest has taken in the interest of sensitive species noted in the analysis. We currently have no evidence that our actions over the past 13 years of Forest Plan implementation have threatened the viability of RFSS, or have contributed to federal listing of a species. In our efforts to protect and enhance the habitats noted above associated with RFSS, we believe that Forest Plan implementation is providing as high a likelihood as possible that the ecological conditions of these habitats are maintained so as to contribute to viability of these species, considering their natural distribution and abundance.

Recommendations

An amendment to the Forest Plan or and/or manual supplement that would serve to make the Forest Plan and our management guidance current with new policies and regulations would be beneficial, and would help to mitigate some potential impacts to RFSS. We recommend the following for consideration in moving our management guidance towards consistency with this new information:

- All general and species-specific management direction for RFSS and species of concern would be moved from appendix E into the "Forest-wide Standards & Guidelines" section of the Forest Plan (chapter 4).
- The Wildlife and Fish Standards and Guidelines structure in chapter 4 of the Forest Plan would be modified by creating three sections: Federally Listed Endangered, Threatened, and Proposed Species; Regional Forester's Sensitive Species; and Forest Species of Concern, and by placing the direction for these species in the appropriate categories. Currently appendix E in the Forest Plan provides direction for a variety of species under the "Species of Concern" section, but some of these species are federally listed or sensitive.
- An update that clarifies the purpose and requirements of the ESA as it relates to the GMNF as well as a summary of the region's objectives for RFSS would be added to appendix E. Updated language for Species of Concern would be added to clarify the distinction between this group and the others. The language associated with the list of "Species of Uncertain Occurrence" in appendix E would be amended to state that species not known to occur on the GMNF that are discovered on the Forest will be identified as potential sensitive species, and will be evaluated for inclusion on the RFSS list using the procedures outlined in FSM 2670. Until the evaluation process has been completed, they would be treated as sensitive.
- Although the RFSS list has changed, we recommend not making any changes to the list of Species of Concern, except where there is clear evidence that such species are not known to exist on the Forest, nor appear to have suitable habitat. Such species would be removed from the list, and would be treated as other species not known to occur on the GMNF.
- Because of the dynamic nature of these various protected species lists, we recommend removing the lists of "Protected Species" from the Forest Plan (Tables E.01 and E.02). The lists of federally endangered, threatened, proposed, and sensitive species would be updated periodically to reflect changes made by the Regional Forester or the FWS in Regional or Federal lists, as well as new species we are evaluating. The process of evaluation for inclusion on various lists will be done in consultation with the Region, neighboring Forests, FWS, State Heritage Programs, TNC, species experts, and other partners. The updated lists will be available on the Region's and GMNF's website, at GMNF offices, and would be included in our annual monitoring report.
- Language would be added to appendix C to require reporting of updates to the RFSS list, in addition to other monitoring objectives for species and habitat groups that would lend accountability to our monitoring efforts. When the list is updated, the new RFSS will fall under the existing protection guidelines in the Forest Plan. The update will also trigger an evaluation of the existing Forest Plan standards and guidelines relative to protection of these species, and if additional standards and guidelines are needed, the Forest Plan will be amended. In general, the listing of a species as sensitive will trigger the development of a Conservation Assessment and Strategy for that species or a group of species. These documents will then generate management guidelines that will attempt to maintain or enhance the persistence of the species, and such guidelines will be what will be evaluated by the GMNF with the public for inclusion in the Forest Plan through an amendment.

The following items would be added to the table in appendix C, under Management Problem #3, Wildlife Habitats, page C.07:

Management Problem	Purpose of Monitoring	Item Monitored	Unit of Measure	Frequency of Measure	Expected Precision	Expected Reliability
	Determine population trends of RFSS to evaluate persistence	**Plant Population**	**Population**	**Every 5 years, unless species strategy dictates a different schedule**	**High**	**Moderate**
		Peregrine falcon	**Habitat & Population**	**Annual**	**High**	**High**
		Bicknell's thrush	**Habitat & Population**	**Annual**	**Moderate**	**High**
		Common loon	**Habitat & Population**	**Annual**	**High**	**High**
		Woodland bats	**See Indiana bat**	**See Indiana bat**	**See Indiana bat**	**See Indiana bat**
		Animals of Stream, Pond, and Pool Habitat	**Habitat**	**Annual**	**Moderate**	**High**
	Determine status of RFSS and species of viability concern	**RFSS & additional species of viability concern**	**Updated list**	**Annual**	**High**	**Moderate**

- "Resource Output Objectives" and "Activities and Outputs to be Monitored" (USDA 1987, chap. 4, sec. D; app. C) regarding RFSS would be modified to reflect more accurate and realistic expectations; this has been a recommendation in past monitoring reports, and will improve our accountability to the public regarding our responsibilities towards RFSS.

The following items would be added under the "Resource Protection Objectives" to replace those under T E & S Species (USDA 1987, Table 4.1):

Result	Expected Amount
Threatened, Endangered & Sensitive Species	
Inventory in potential habitat	**2,500 acres/year**
New occurrences found	**Unknown # of occurrences**
Biological evaluations prepared	**Unknown # of evaluations**
Protection through project mitigation	**Unknown # occurrences**
Conservation Assessments completed	**1 species or group/year**
Conservation Agreements signed	**Unknown # of species**

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Appendix 1

PLANTS THAT ARE NOT LISTED AS PRESENT OR SENSITIVE FOR THE GMNF IN THE 2000 RFSS UPDATE THAT WERE FOUND IN JENKINS 1988 FLORA OF VERMONT, BUT ARE NOT KNOWN OR LIKELY TO OCCUR IN THE GMNF BASED ON VNNHP RECORDS, JENKINS 1981, AND LACK OF LOCAL OBSERVATIONS DURING SURVEYS.

12/20/00

Scientific Name	Common Name	Status in VT
Amerorchis rotundifolia	Small round-leaved orchis	VT historic
Armoracia lacustris (=Neobeckia aquatica)	Lake-cress	VT threatened;
Asclepias purpurascens	Purple milkweed	Report only (Jenkins 1988); couldn't demonstrate existed in VT – no specimens (Jenkins, pers. comm. 2000)
Asplenium trichomanes-ramosum (=viride)	Green spleenwort	VT threatened
Astragalus canadensis	Canadian milk-vetch	VT threatened
Betula minor	Dwarf white birch	Deleted from flora (= *B. papyrifera;* Jenkins 1988)
Bidens discoidea	Small bidens	VT rare/uncommon
Botrychium lanceolatum var. angustisegmentum	Narrow triangle moonwort	VT uncommon
Botrychium oneidense	Blunt-lobed grapefern	VT very rare/rare
Botrychium rugulosum	Rugulose grapefern	VT very rare/rare
Callitriche hermaphroditica	Autumnal water-starwort	VT historic
Calypso bulbosa	Fairy slipper	VT threatened
Campanula aparinoides	Marsh bellflower	VT occasional (Jenkins 1988)
Cardamine maxima	Large toothwort	VT common (Gilman 1999)
Carex crawei	Crawe sedge	Report only (Jenkins 1988); only on Valcour Island – Fernald thought it should be in VT but never documented (Jenkins, pers. comm. 2000)
Carex hitchcockiana	Hitchcock's sedge	VT uncommon
Carex lupuliformis	False hop sedge	VT rare
Carex novae-angliae	New England sedge	VT occasional (Jenkins 1988)
Carex sterilis	Dioecious sedge	Deleted from flora (*C. echinata*; Jenkins 1988)
Carex tetanica	Rigid sedge	Report only (Jenkins 1988); no specimens for VT (Jenkins, pers. comm. 2000)
Carex weigandii	Weigand's sedge	VT very rare
Cimicifuga rubifolia	Black cohosh	Report only (Jenkins 1988); no specimens for VT (Jenkins, pers. comm. 2000)

Scientific Name	Common Name	Status in VT
Cynoglossum virginianum (=boreale) var boreale	Northern wild comfrey	Not known to occur on GMNF; historic occurrence in Salisbury may be GMNF, but repeated searches during the last 12 years have failed to relocate. Not likely to occur based on current information.
Cypripedium arietinum	Ram's-head ladyslipper	Not known to occur in GMNF. One 19th century historic occurrence from Addison County may be GMNF, but areas of potential habitat have either been significantly altered (converted to a hill farm in the early 20th century), or surveyed with no occurrences found. Not likely to occur based on current information.
Eleocharis nitida	Slender spikerush	VT historic
Empetrum nigrum	Black crowberry	VT very rare
Equisetum palustre	Marsh horsetail	VT threatened
Erigeron hyssopifolius	Hyssop-leaved fleabane	VT rare
Eriophorum tenellum	Rough cotton-grass	VT status uncertain; rare (Jenkins 1988)
Galium brevipes	Limestone swamp bedstraw	VT historic; deleted from flora (= *G. labradoricum*; Jenkins 1988)
Geocaulon lividum	Northern toadflax	VT extirpated
Geum peckii	Mountain avens	Report only (Jenkins 1988); no specimens in VT (Jenkins, pers. comm. 2000)
Hydrastis canadensis	Goldenseal	VT endangered
Hypericum gentianoides	Orange-grass St. John's-wort	VT rare/uncommon
Juncus brachycarpus	Short-fruit rush	Deleted from flora (Jenkins 1988)
Juncus vaseyi	Vasey sedge	VT very rare
Listera convallarioides	Broad-leaved twayblade	VT occasional (Jenkins 1988)
Lycopodiella appressa	Slender bog-clubmoss	VT historic
Malaxis brachypoda	White adder's-mouth	VT threatened
Menyanthes trifoliate	Bog buckbean	VT occasional (Jenkins 1988)
Moehringia macrophylla	Large-leaved sandwort	VT rare
Napaea dioica	Glade mallow	Missing (Jenkins 1988); cultivar – not native (Jenkins, pers. comm. 2000)
Nymphaea leibergii	Dwarf water-lily	VT very rare
Orobanche uniflora	One-flowered broomrape	VT occasional (Jenkins 1988)
Panicum philadelphicum	Philadelphia panic-grass	VT historic
Paronychia argyrocoma	Silverling	Uncertain provenance (Jenkins 1988); historic specimen but location and habitat vague; no extant occurrences known (Jenkins, pers. comm. 2000)
Petasites frigidus var. palmatus	Sweet coltsfoot	VT threatened

Scientific Name	**Common Name**	**Status in VT**
Platanthera ciliaris	Yellow fringe orchid	Uncertain provenance (Jenkins 1988); complicated story – white and yellow fringed orchids, when pressed, lose their floral color differentiation – then it boils down to depth of lobing (if that's a reliable character); known from early 1823 flora of Middlebury, but uncertain reliability; Cited by Ames in a Missouri collection crediting it to VT – 1861 – but is missing; VT collection from 1861 of Cary – when collected labeled as white fringed; 50 years later relabeled as yellow by Ames; specimen has been remounted (when unknown) – label is different age – suggests an error in remounting; bottom line - no collector has ever said we had one (Jenkins, pers. comm. 2000).
Polygonum arifolium	Halberd-leaf tearthumb	VT occasional
Polygonum careyi	Carey's smartweed	VT historic
Potamogeton pulcher	Spotted pondweed	Report only (Jenkins 1988); coastal plain species – doesn't occur in VT (Jenkins, pers. comm. 2000).
Prenanthes boottii	Boott's rattlesnake-root	VT endangered
Primula mistassinica	Bird's-eye primrose	VT threatened
Pterospora andromedea	Pinedrops	VT endangered
Salix pellita	Satiny willow	VT very rare
Scirpus purshianus	Pursh's bulrush	VT rare/uncommon
Subularia aquatica	Water awlwort	VT historic
Trichostema brachiatum	False pennyroyal	VT historic
Trichostema dichotomum	Forked bluecurls	VT occasional (Jenkins 1988)
Triphora trianthophora	Three-bird orchid	VT threatened
Vaccinium boreale	Boreal blueberry	VT very rare
Valeriana uliginosa	Marsh valerian	VT endangered

ANIMALS THAT ARE NOT LISTED AS PRESENT OR SENSITIVE FOR THE GMNF IN THE 2000 RFSS UPDATE THAT ARE NOT KNOWN OR LIKELY TO OCCUR IN THE GMNF (OR IN SOME CASES VERMONT) BASED ON VNNHP RECORDS, LACK OF LOCAL OBSERVATIONS DURING SURVEYS, OR REFERENCES NOTED.

12/21/00

Scientific Name	Common Name	Range
MAMMALS		
Neotoma magister	Allegheny Woodrat	VT outside of range (Godin)
Nycticeius humeralis	Evening Bat	VT outside of range (Godin)
Phenacomys intermedius	Heather Vole	VT outside of range (Godin)
Sorex palustris punctulatus	Southern Water Shrew	VT outside of range (Godin)
Synaptomys borealis sphagnicola	Northern Bog Lemming	VT outside of range (Godin)
Taxidea taxus	American Badger	VT outside of range (Godin)
BIRDS		
Sterna hirundo	Common Tern	Not know from GM (Laughlin), no suitable habitat on GM, State Endangered
Aegolius funereus	Boreal Owl	GM outside of range (1, DeGraaf)
Aimophila aestivalis	Bachmann's sparrow	VT outside of range (2, DeGraaf)
Ammodramus henslowii	Henslow's Sparrow	Not know from GM (Laughlin),no suitable habitat on GM, State Endangered
Ammodramus leconteii	Le Conte's Sparrow	VT outside of range (2, DeGraaf)
Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow	VT outside of range
Asio flammeus	Short-eared Owl	Not know from GM (Laughlin),no suitable habitat on GM
Bartramia longicauda	Upland Sandpiper	Not know from GM (Laughlin), no suitable habitat on GM, State Threatened
Chlidonias niger	Black tern	Not know from GM (Laughlin), no suitable habitat on GM, State Threatened
Circus cyaneus	Northern Harrier	Not know from GM (Laughlin), no suitable habitat on GM
Coturnicops noveboracensis	Yellow Rail	Not know from VT (Laughlin)
Cygnus buccinator	Trumpeter Swan	Not know from VT (Peterson)
Dendroica castanea	Bay-breasted Warbler	Not know from GM (Laughlin), no suitable habitat on GM
Dendroica cerulea	Cerulean Warbler	Not know from GM (Laughlin), no suitable habitat on GM
Dendroica discolor	Prairie Warbler	Not know from GM (Laughlin), no suitable habitat on GM
Falcipennis canadensis	Spruce Grouse	Not know from GM (Laughlin), no suitable habitat on GM, State Endangered
Ixobrychus exilis	Least Bittern	Not know from GM (Laughlin), no suitable habitat on GM
Lanius ludovicianus migrans	Migrant Loggerhead Shrike	Not know from GM (Laughlin), no suitable habitat on GM, State Endangered

Scientific Name	**Common Name**	**Range**
Limnothlypis swainsonii	Swainson's Warbler	VT outside of range (Peterson)
Nycticorax nycticorax	Black-crowned Night Heron	Not know from GM (Laughlin), no suitable habitat on GM
Oporornis agilis	Connecticut Warbler	VT outside of range (Peterson)
Phalaropus tricolor	Wilson's Phalarope	VT outside of range (Peterson)
Picoides tridactylus	Tree-toed Woodpecker	Not know from GM (Laughlin), no suitable habitat on GM
Rallus elegans	King Rail	Not know from VT (Laughlin)
Sterna caspia	Caspian Tern	Not know from VT (Peterson)
Strix nebulosa	Great Gray Owl	Not know from VT (Peterson)
Tympanuchus phasianellus	Sharp-tailed Grouse	Not know from VT (Peterson)
AMPHIBIANS		
Aneides aeneus	Green Salamander	Not know from VT (Andrews)
Cryptobranchus alleganiensis	Hellbender	Not know from VT (Andrews)
Cryptobranchus alleganiensis Bishopi	Ozark Hellbender	Not know from VT (Andrews)
Hyla avivoca	Bird-voiced Tree Frog	Not know from VT (Andrews)
Rana blairi	Plains Leopard Frog	Not know from VT (Andrews)
REPTILES		
Clemmys muhlenbergii	Bog Turtle	Not know from GM (Andrews), no suitable habitat on GM
Clonophis kirtlandii	Kirtland's Snake	Not know from VT (Andrews)
Crotalus horridus	Timber Rattlesnake	Not know from GM (Andrews), no suitable habitat on GM, State Endangered
Emydoidea blandingii	Blanding's Turtle	Not know from VT (Andrews)
Macroclemys temminckii	Alligator Snapping Turtle	Not know from VT (Andrews)
Sistrurus catenatus catenatus	Eastern Massasauga	Not know from VT (Andrews)
Terrepene carolina Carolina	Eastern Box Turtle	Not know from VT (Andrews)
MOLLUSKS		
Alasmidonta marginata	Elktoe	Not known from VT (Fichtel & Smith
Antrobia culveri	Tumbling Creek Cavesnail	Not known from GM
Arcidens confragosus	Rock Pocketbook	Not known from VT (Fichtel&Smith)
Carychium exile	Ice Thorn	Not known from GM
Catinella exile	land snail	Not known from GM
Cumberlandia monodonta	Spectacle case	Not known from VT (Fichtel&Smith)
Cyprogenia aberti	Western Fanshell	Not known from VT (Fichtel&Smith)
Epioblasma triquetra	Snuffbox	Not known from VT (Fichtel&Smith)
Euconulus alderi	land snail	Not known from GM
Fontigens tartarea	Organ cavesnail	Not known from GM
Fusconaia subrotunda	Longsolid	Not known from GM
Lampsilis fasciola	Wavyrayed Lampmussel	Not known from VT (Fichtel&Smith)
Lampsilis teres	Yellow Sandshell	Not known from VT (Fichtel&Smith)
Lasmigona costata	Fluted-shell Mussel	Not known from GM (Fichtel&Smith) no suitable habitat on GM, State Endangered
Lasmigona subviridis	Green Floater	Not known from VT (Fichtel&Smith)
Ligumia recta	Black Sandshell	Not known from GM (Fichtel&Smith) no suitable habitat on GM, State Endangered
Obovaria jacksoniana	Southern Hickorynut	Not known from GM
Obovaria subrotunda	Round Hickorynut	Not known from GM
Ouadrula cylindrica cylindrical	Rabbitsfoot	Not known from GM

Scientific Name	**Common Name**	**Range**
Plethobasus cyphus	Sheepnose	Not known from VT (Fichtel&Smith)
Pleurobema cordatum	Ohio Pigtoe	Not known from VT (Fichtel&Smith)
Pleurobema rubrurm	Pyramid Pigtoe	Not known from VT (Fichtel&Smith)
Ptychobranchus occidentalis	Ouachita Kidneyshell	Not known from GM
Simpsonaias ambiguq	Salamander mussel	Not known from VT (Fichtel&Smith)
Stenotrema (=Euchemotrema) hulbrici	Carinate Pillsnail	Not known from GM
Toxolasma lividus	Purple Liliput	Not known from VT (Fichtel&Smith)
Toxoplasma parvus	Lilliput	Not known from VT (Fichtel&Smith)
Vallonia gracilicosta albula	snail	Not known from GM
Venustaconcha ellipsiformis	Ellipse	Not known from VT (Fichtel&Smith)
Vertigo bollesiana	land snail	Not known from GM
Vertigo meramecensis	Bluff Vertigo	Not known from GM
Vertigo morsei	Land snail	Not known from GM
Vertigo paradoxa	Mystery Vertigo	Not known from GM
Villosa lienosa	Little Spectaclecase	Not known from VT (Fichtel&Smith)
INSECTS		
Aflexia rubanura	Red-veined Prairie Leafhopper	Not Known From GM
Aleochara lucifuga	Cave rove beetle	Not Known From GM
Amblyscirtes belli	Bell's Roadsude Skipper	Not Known From GM
Appalachia arcane	Michigan bog grasshopper	Not Known From GM
Atrytonopsis hianna	Dusted Skipper	Not Known From GM
Calephelis mutica	Swamp metamark	Not Known From GM
Ceraclea vertreesi	Verteree's Caddisfly	Not Known From GM
Cicidela denikei	Tigar beetle	Not Known From GM
Cinindela patruela patruela	Tigar beetle	Not Known From GM
Eacles imperialis pini	The Imperial Moth	Not Known From GM
Erebia disa mancinus	Manicinus Alpine	Not Known From GM
Erabia discoidalis discoidalis	Red-disked Alpine	Not Known From GM
Erynnis martialis	Mottle Dusky wing	Not Known From GM
Erynnis persius	Persius Dusky Wing	Not Known From GM
Euchole olympia	Olympia Marble	Not Known From GM
Gomphus fraternus	Midland Clubtail	Not Known From GM
Gomphus quadricolor	Rapids Clubtail	Not Known From GM
Gomphus virifrons	Green-faced Clubtail	Not Known From GM
Helocordulia uhleri	Ulher's Sundragon	Common and well distributed on GM (Carle)
Hesperia ottoe	Ottoe skipper	Not known from GM
Incisalia henrici	Henry's elfin	Not known from GM
Incisalia irus	Frosted elfin	Not known from GM
Lepyronia gibbosa	Hill-prairie Spittlebug	Not known from GM
Lycaeides idas nabokovi	Nabokov's (Northern) Blue	Not known from GM
Macromia wabashenisis	Wabash River Cruiser	Not known from GM
Merolonche dolli	Doll's merolonche	Not known from GM
Oarisma powesheik	Poweshiek Skipper	Not known from GM
Ochrotrichia contorta	Micro caddisfly	Not known from GM
Oeneis jutta ascerta	Jutta artic	Not known from GM
Ophigomphus anomalus	Extra-striped snaketail	Not known from GM
Ophigomphus howei	Pygmy snaketail	Not known from GM
Papaipema beeriana	Blazing star stem borer	Not known from GM
Papaipema eryngii	Rattlesnake-master borer moth	Not known from GM
Pieris virgiensis	West Virginia White	Not known from GM

Scientific Name	Common Name	Range
Pseudanophthalmas fuscus	Cave beetle	Not known from GM
Pseudanophthalmas hadenoecus	Timber Ridge cave beetle	Not known from GM
Pseudoanophthalmas hypertrichos	Cave beetle	Not known from GM
Pseudanophthalmas montanus	Dry Fork Valley ground Beetle	Not known from GM
Pseudanophthalmas tenuis (=stricticollis) jeanneli	Troglobitic ground beetle	Not known from GM
Pseudanophthalmus youngi young	Young's cave ground beetle	Not known from GM
Pseudosinella certa	Gandy Creek cave springtail	Not known from GM
Pseudosinella espana	Springtail	Not known from GM
Pseudosinella fonsa	Fountain Cave Springtail	Not known from GM
Pseudosinella gisini	Springtail	Not known from GM
Pygarctia spraguei	Sprague's pygarctic	Not known from GM
Pyrgus centaureae freija	Freija's pygarctic	Not known from GM
Pyrgus wyandot	Southern grizzled skipper	Not known from GM
Schinia indiana	Phlox Moth	Not known from GM
Sinella agna	Springtail	Not known from GM
Sinella alata	Wingless winged cave springtail	Not known from GM
Sinella cavernacum	Cavernicolous springtail	Not known from GM
Somatochlora incurvata	Warpaint emerald	Not known from GM
Spartiniphaga inops	Spartina borer moth	Not known from GM
Speyeria diana	Diana frittilary	Not known from GM
Speyeria idalia	Regal frittilary	Not known from GM
Sphalloplana culveri	Culver's planarium	Not known from GM
Stenelmis douglasensis	Douglas Stenelmis riffle beetle	Not known from GM
Styurus scudderi	Zebra clubtail	Not known from GM
Tomocerus bedentatus	Two-toothed springtail	Not known from GM
Trimerotropis huroniana	Lake huron locust	Not known from GM
INVERTEBRATES		
Allocrangonyz hubrichti	Central Missouri cave amphipod	Not known from GM
Apochthonius paucispinosus	Dry Fork Valley cave pseudoscorpion	Not known from GM
Caecidontea cannulus	Isopod	Not known from GM
Caecidontea dimorpha	Isopod	Not known from GM
Caecidontea holsingeri	Holsinger's cave isopod	Not known from GM
Caecidontea simonini	Isopod	Not known from GM
Caecidontea sinuncus	isopod	Not known from GM
Calymmaria cavicola	Cave funnel-web spider	Not known from GM
Cambarus hubrichti	Salem cave crayfish	Not known from GM
Cambarus nerterius	Underground crayfish	Not known from GM
Cambarus setosus	Bristly cave crayfish	Not known from GM
Cauloxenus stygius	Cave obligate copepod	Not known from GM
Conotyla bollmani	Bollman's cave millepede	Not known from GM
Crangonyx packardi	Packard's cave amphipod	Not known from GM
Erebomaster falvescens	Goldern cave harvestman	Not known from GM
Hesperochernes mirablis	Wonderful pseudoscorpion	Not known from GM
Macrocotyla hoffmasteri	Hoffmaster's cave flatworm	Not known from GM
Megacyclops spp.	Campground cave copepod	Not known from GM
Nesticus cateri	Carter's cave spider	Not known from GM
Orconectes eupunctus	Coldwater crayfish	Not known from GM
Orconectes harrisonii	Big river crayfish	Not known from GM
Orconectes indianensis	Indiana crayfish	Not known from GM
Orconectes kentuckiensis	Kentucky crayfish	Not known from GM

Scientific Name	**Common Name**	**Range**
Orconectes meeki	Crayfish	Not known from GM
Orconectes peruncus	Big Creek crayfish	Not known from GM
Orconectes placidus	Crayfish	Not known from GM
Orconectes quadruncus	St. Francis River crayfish	Not known from GM
Orconectes williamsi	White River midget crayfish	Not known from GM
Orconectes inermis inermis	Northern cave crayfish	Not known from GM
Porhomma cavernicola	Cavernicolous sheet-web spider	Not known from GM
Pseudotremia fulgida	Greenbrier Valley cave millipede	Not known from GM
Pseudotremia lusciosa	Germany Valley cave millipede	Not known from GM
Pseudotrmia princeps	South Branch Valley cave millipede	Not known from GM
Scytonotus granulatus	Granulated millipede	Not known from GM
Stygobromus culveri	Culver's cave isopod	Not known from GM
Stygobromus emarginatus	Greenbrier cave isopod	Not known from GM
Stygobromus nanus	Pocahontas cave isopod	Not known from GM
Stygobromus onodagaensis	Onodaga cave isopod	Not known from GM
Stygobromus parvus	Minute cave isopod	Not known from GM
Stygobromus subtilis	Subtle cave amphipod	Not known from GM
Trichopetalum krekeleri	Millipede	Not known from GM
Trichopetalum weyeriensis	Grand Caverns blind cave millipede	Not known from GM
Trichopetalum whitei	Luray Caverns blind cave millipede	Not known from GM

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